Railway Age Gazette
MECHANICAL EDITION
INCLUDING THE
AMERICAN ENGINEER

PUBLISHED ON THE FIRST THURSDAY OF EVERY MONTH BY THE
SIMMONS-BOARDMAN PUBLISHING COMPANY,
WOOLWORTH BUILDING, NEW YORK, N. Y.

CHICAGO: Transportation Bldg. CLEVELAND: Citizen's Bldg.
LONDON: Queen Anne's Chambers, Westminster.

EDWARD A. SIMMONS, *President* L. B. SHERMAN, *Vice-President*
HENRY LEE, *Secretary*
The address of the company is the address of the officers.

ROY V. WRIGHT, *Editor*
R. E. THAYER, *Associate Editor* C. B. PECK, *Associate Editor*
A. C. LOUDON, *Associate Editor* GEORGE L. FOWLER, *Associate Editor*

Subscriptions, including the eight daily editions of the *Railway Age Gazette* published in June in connection with the annual conventions of the Master Car Builders' and American Railway Master Mechanics' Associations, payable in advance and postage free:

United States, Canada and Mexico	$2.00 a year
Foreign Countries (excepting daily editions)	3.00 a year
Single Copy	20 cents

Entered at the Post Office at New York, N. Y., as mail matter of the second class.

WE GUARANTEE, that of this issue 4,150 copies were printed; that of these 4,150 copies 3,651 were mailed to regular paid subscribers, 150 were provided for counter and news companies' sales, 232 were mailed to advertisers, exchanges and correspondents, and 117 were provided for samples and office use; that the total copies printed this year to date were 43,100, an average of 4,310 copies a month.

VOLUME 88 OCTOBER, 1914 NUMBER 10

CONTENTS

EDITORIALS:
- Car Department Competition 501
- Educate the Engine Crews 501
- Special Man for Laying Out 501
- Reclaiming Material on the Frisco 501
- Employees' Responsibility in Promoting Economy 502
- The Road Foreman's Part in Preventing Failures 502
- British Steel Coaches 502
- Provide Adequate Coaling Facilities at Terminals 502
- Traveling Engineers' Convention 503
- New Books 503

COMMUNICATIONS:
- The Special Apprentice 504
- Handling Metallic Packing in Roundhouses 504
- The Draft Gear Problem 504

GENERAL:
- Traveling Engineers' Convention 505
- Some English Locomotive Appliances 512
- Metal Pilot on the Lehigh Valley 513
- Ringleman Smoke Chart 514
- Device for Feeding Boiler Compound 514

CAR DEPARTMENT:
- Steel Underframes for Use on Wooden Freight Cars 515
- Saving Car Days 516
- Long Island Steel Baggage Car 517
- Car Department Correspondence 521
- Special Dining Car for Troops 522
- Coach Step with Four Treads 523
- Steel Construction in Foreign Cars 523
- Form for Noting Freight Car Repairs 526

SHOP PRACTICE:
- Master Painters' Convention 527
- Reclaiming Material on the Frisco 531
- Burning Out Oil Deposits in Air Pumps 538

NEW DEVICES:
- Recent Designs of Engine and Tender Trucks 539
- Portable Steam Sterilizer 541
- Portable Arc Welder 541
- Structural Steel Tender Truck 542
- Reflex Water Gage with Metal Encased Glass 542
- Double Spindle Lathe 543
- Locomotive By-Pass Drifting Valve 544
- Gravity Boiler Washing System 545
- Malleable Iron Welded by Oxy-Acetylene 546
- Corrugated Steel Door with Fender Attachment 547
- Staybolt Chuck 547
- Mudge-Peerless Ventilator 548
- Soft Metal Grinders for Superheater Unit Connections 549
- Gravity Fire Door 550

NEWS DEPARTMENT:
- Notes 551
- Meetings and Conventions 552
- Personals 553
- New Shops 555
- Supply Trade Notes 555
- Catalogs 556

Car Department Competition

The competition on defective box cars and how the defects may be overcome or remedied, which was announced in our August and September issues, will close on October 15. Because of the considerable amount of attention which was given to the draft gear problem in the earlier competition it is the purpose in the present one to leave the draft gear out of consideration. A first prize of $50 will be awarded for the paper containing the most practical suggestions for remedying the defects; papers not awarded a prize, but accepted for publication, will be paid for at our regular space rates.

Educate the Engine Crews

"Educate the Engine Crews" might well be taken as the slogan of the twenty-second annual convention of the Traveling Engineers' Association, held in Chicago last month. We do not wish to infer, however, that the enginemen on American railroads are ignorant, for such is not the case. Our enginemen are a fine class of men; if they were otherwise they wouldn't be where they are. What is meant is that with the introduction of the various labor saving and economical devices on locomotives the engine crew must be carefully and thoroughly instructed as to their proper manipulation in order that the greatest benefit may be obtained from their use. This is especially true of smoke eliminating devices, the superheater and the stoker. In every subject considered at the convention the proper education of the engine crew was believed to be the key note of success.

Special Man for Laying Out

The practice of assigning a special expert mechanic to laying out all work to be done in a machine shop has been found to be especially advantageous from many standpoints. A man who has this special duty will naturally become very proficient and will be able to lay out more work in a given time than the men by whom the work is to be machined. The practice saves the time of the machines, as well as the men, for the operators do not have to hold their machines idle while the work is being laid out. If a piece of work is not of the proper dimensions it will get no farther than the layer-out, whereas in the absence of this system it is likely to have been placed in position on the machine. Under this plan all jigs and templates are put in one place and under the care of one man, the layer-out, and are therefore kept in good condition and where they can be found when they are wanted. There is less chance for error in the finished dimensions, and as a whole the work can be put through the shop with much greater despatch.

Reclaiming Material on the Frisco

The handling and reclaiming of scrap material has been a troublesome problem to the railroads for many years. Different roads have tackled it in different ways. In some cases, due to faulty accounting or lack of appreciation of the relative value of the various factors entering into the problem, methods have been adopted which finally proved to be far from economical; in other cases good judgment has made it possible to reclaim certain parts of the scrap with splendid results. The Santa Fe, a few years ago, established a large plant for handling and reclaiming scrap at Corwith, Ill., near Chicago. The savings effected for the year ending June, 1913, are said to have amounted to half a million dollars. A similar plant which is very fully described in another part of this issue has been developed on the St. Louis & San Francisco during the past year. It was fully realized in inaugurating this work that unless a most careful check was kept on each individual item there would be a tendency to actually waste money in the attempt to reclaim parts which could not be handled with profit. To avoid this great care is taken to study the detailed costs of

reclaiming each item, and to follow it into service to make sure that it does its work properly and does not fail prematurely. As in the case of the plant at Corwith the oxy-acetylene apparatus is a most important factor, not only in the making of repairs but in cutting certain classes of scrap, such as fireboxes and tender tanks, into parts of such size that they may be more easily handled and bring a much better price per pound as scrap.

Employees' Responsibility in Promoting Economy

Any one who has worked in a railroad shop is familiar with the expression "The company is rich; it can stand it." It is a matter of common occurrence for a man to make such a remark to his fellow employees in good-natured justification of a waste of time or material. In the minds of a surprisingly large number of railway employees the company for which they work is a corporation of almost unlimited wealth; to them the company means the higher officers, and they do not realize that although the financial receipts may be large the expenditures are probably of a size to leave but a small margin of profit. They feel amply justified in getting all they can out of the company and consequently a waste of half an hour in a locomotive firebox or the throwing into the scrap pile of a tool that could be repaired at a slight cost are items which from their viewpoint affect the company's treasury to such a small degree as to be entirely negligible. There is wide opportunity for economy in bringing railway men in general and shop employees in particular to realize that time and material which they can save in their personal work can have a direct and considerable bearing on the condition of the company's treasury and consequently on their own prosperity. While means should be taken to instill these ideas into the older employees, the place for the most earnest efforts is in the apprentice school, and in this connection the simpler the explanation can be made the better. It is of little use to try to explain to a class of apprentices by making use of long lists of figures and financial terms, but there is no reason why a simple explanation cannot be given of what a company is, how it is organized and what class of people make up the bulk of its stockholders. In many instances the lesson will be kept in mind and while it seems a hopeless task to bring all employees to a correct understanding of such matters, a continued process of education and enlightenment will result in a surprising increase in the efforts of individual employees toward economy.

The Road Foreman's Part in Preventing Failures

There were several points dwelt upon by J. F. DeVoy, assistant superintendent of motive power of the Chicago, Milwaukee & St. Paul, in his address at the recent convention of the Traveling Engineers' Association which should meet with general approval. Among these was the statement that the traveling engineer, or to use the better title, road foreman of engines, should not spend too much time investigating failures and delays, but should get out on the road and work with the men to prevent such occurrences. Unquestionably the road foreman must conduct investigations, but he should not, as is very often the case, spend almost his entire time in conducting them and in preparing long reports. The road foreman of engines is often made too much of an investigator and in consequence degenerates to a seeker after the cause of troubles that have become ancient history.

There will always be investigations to be held and that consideration cannot be neglected, but by his methods in dealing with the men under him the foreman can greatly reduce these in number. His most important duty should be to educate and develop a class of men who will use their thinking powers in such a way that they will keep out of trouble. A man who is appointed to the position of road foreman of engines should be of an even temperament and have a disposition which will command the friendly feeling and respect of those under him; he should be capable of training men, and in investigations of getting at all the evidence, weighing it judicially and basing his decision on sound reasoning. The selection and training of firemen, which should devolve upon the road foreman, should be given as much if not more care than the selection and training of shop apprentices. A man without the proper qualifications who is appointed to the position of road foreman of engines is likely to make poor selections in hiring men and ill-judged decisions in enforcing discipline, and can do much more harm than good. The selection of a man for the position of road foreman is a matter which should always receive the most careful attention of the officers making the appointment.

British Steel Coaches

Several of the features of British practice in the construction of steel passenger equipment which are brought out in an article appearing elsewhere in this issue will be rather difficult of explanation, if not entirely unaccountable to American car builders. While as a whole the Metropolitan District car therein illustrated is not typical of British construction, the underframe is of a type very similar to that frequently used on cars with wooden superstructures. The typical features of this underframe are the use of four longitudinal members of uniform cross section, the placing of truss rods below some of the longitudinal members and the design of the cross-members, which are offset to pass under the center longitudinals. With the type of couplers and buffers used on British coaches the buffing and pulling stresses are more readily distributed over the entire underframe than would be possible with the type of draft gear used in this country; and the uniform size of longitudinal members as well as their spacing may thus be logically accounted for. It is difficult, however, to logically account for the use of truss rods with steel underframe construction. With wood sills the use of truss rods is very effective, the amount of initial tension required in the rods being small because of the comparatively large deflection of the wood sills under load. With steel sills the case is entirely different. Unless the rods are adjusted to have an excessive initial tension the deflection of the sills necessary before full advantage of the truss rods is obtained might be close to or even exceed the elastic limit of the material in the sills. If placed under sufficient initial tension to insure effective service the margin of strength available for service will be greatly reduced. In other words it would seem that the great precision of adjustment required is such as to make the strength of the arrangement very uncertain. Taken altogether, British steel construction appears to have gone very little beyond the substitution of steel members for those originally of wood, the original form of construction being closely followed. Practically no attempt seems to have been made to take advantage of the possibilities offered by steel construction.

Provide Adequate Coaling Facilities at Terminals

It is surprising how many times in laying out new engine terminals, or renewing old ones, careful provision is made for a modern engine house at the expense of the coaling and ash pit facilities. It is not intended by any means to decry the need of providing a strictly adequate and up-to-date engine house with corresponding repair equipment; the idea that any kind of a building fitted with cast-off tools and other equipment is good enough for carrying on terminal repairs to locomotives is a wrong one, and has fortunately, to a considerable extent, been gotten away from within recent years. But when a certain number of trains are handled daily on a division, a corresponding number of engines must be turned at the engine house, and it matters not how nearly perfect the repair facilities may be if the equipment for coaling and the handling of ashes, which constitute the neck of the bottle, is sufficient. There is nothing more annoying to an engine house foreman than a con-

gested coaling station or ash pit, and there is nothing that is more productive of terminal delays. When traffic is heavy, and particularly in cold weather, an inadequate coaling station or ash pit will result in a line of locomotives standing out doors possibly for several hours when they should be in the engine house undergoing repairs. In consequence more work is necessitated by some of the engines arriving at the ash pit with frozen hopper slides, or finally reaching the engine house with frozen injector supply or delivery pipes, or leaky tubes. Under such conditions a foreman is likely to resort to putting some of the engines in the house without coal, and even in extremities dumping fires in the engine house pits. This latter practice is extremely dangerous, as a fire may very easily be started if there is a wooden floor. In any event it is necessary to stop long enough to coal the engine on the way out, with the likelihood of a terminal delay resulting. It is, of course, most desirable to provide an engine terminal complete in every particular, but in cases where some part of the plant has to be skimped because of a lack of money, it is much better in the interests of the prompt moving of traffic to provide ample coaling and ash pit facilities and permit part of the engine house facilities to remain uncompleted until a later date when financial conditions are better.

Traveling Engineers' Convention

"A successful convention" has become a habit with this association with all the intensifying characteristics a "habit" has. The meeting was well attended both in registration and the number of members sitting in the convention hall. Four days of hard work from shortly after nine in the morning until after five in the afternoon was the pace set by President Roesch and to the credit of the association the members were as strong at the finish as at the start.

Some very important subjects were covered this year, two of which should be particularly mentioned, "The Care of Locomotive Brake Equipment" and "The Efficient Operation of Locomotives." The former paper was presented in such detail and contains such valuable information that it would pay a road to have it bound separately and distributed to all employees that are concerned in the maintenance and care of the air brake on locomotives. The air brake is a very important item in train operation. It is as important as the locomotive itself under the present day requirements in the operation of trains, for without it the density of traffic could not be anything like what it is. The air brake if not properly maintained may cause serious trouble from wrecks, which means loss of money to the railroad. It therefore is a large factor in the operating expense of any road. In view of the vital part it plays in the train operation it seems that almost any expense made to insure its proper operation would be justified. A careful terminal inspection, both on arriving and on leaving, is positively necessary for economical operation. The enginemen should be made to realize the importance of reporting every defect in the air brake system that comes to their attention, and in justice to themselves and their families, if not to the railroad that employs them, they should insist on the air brake system being in perfect condition before leaving the terminal.

The efficient operation of the locomotive is chiefly the result of proper education of the engine crews and of the men making inspections and repairs on locomotives. The enginemen should be assisted and encouraged in efficient operation by making their work as light and convenient as possible. Nothing will please an engineer more than a conveniently arranged locomotive cab and a free running, well maintained engine. Under such conditions he will be more liable to use thought and care in the handling of his engine and seek to get the most out of it. The fireman also will do his part when he finds that the company desires to aid him in his work. If the fire door is loosely hung so that it requires an effort to open and close it, will the fireman follow the "one scoop to a fire" plan conscientiously? If the flues are plugged or leaking will he try to save coal so that it may be wasted through an inefficient boiler? All of the employees must be met half way, the engine crew with a properly designed and properly maintained locomotive, and the repair men with proper tools with which to do the work. Labor is the largest item of expense in locomotive maintenance and operation, with the exception of the fuel, and money invested to encourage labor to give its best efforts will be well invested.

Another item which greatly affects the cost of locomotive operation is the terminal facilities for turning and handling power. This subject is a large study by itself, especially on a road that operates its locomotives on a pooled basis. Investigations have shown that power is in the hands of the mechanical department the greater part of every 24 hours. To overcome this delay careful study of the terminal facilities and organization should be made.

The arguments for regularly assigned engines for the engine crews was so overwhelming that there can be no question as to where the association stands in this regard. Various illuminating records of what had been accomplished by the regularly assigned engine plan as against the pooled system showed that from an operating standpoint, at any rate, the former was much the more economical and satisfactory method to adopt. From the number of roads that have given up the pooled system it would seem that there is no question as to the economy of the regularly assigned engines plan.

The attitude of the association could be considered as "extremely enthusiastic" in regard to the locomotive mechanical stoker. The stoker has been applied for a sufficient length of time to give the enginemen an opportunity of becoming thoroughly familiar with it, and the opinions of the traveling engineers might be taken as a direct reflection of the opinions of the enginemen themselves. We hear this year of the increased tonnage that may be handled with the stoker fired locomotive without, in two cases at least, any more fuel being used than would be required with the hand fired engines. The stokers are accepted as having a distinct advantage in certain classes of service and the traveling engineers look to them to greatly improve operating conditions.

The paper on the "Practical Chemistry of Combustion," by Mr. Kinyon will round out the proceedings of this convention into a volume of instruction that will be of value and credit to the members of the Traveling Engineers' Association.

NEW BOOKS

Air Brake Association. Proceedings of the 1914 convention. Illustrated, 242 pages. 6 in. by 9 in. Published by the association. F. M. Nellis, 53 State street, Boston, Mass., secretary. Price $2.

The Air Brake Association has made a record this year in placing the bound volume of the twenty-first annual convention in the hands of the members about two months after the convention met. This year's report includes addresses by H. H. Vaughan, assistant to vice-president, Canadian Pacific, and W. A. Garrett, formerly chief executive officer of the Pere Marquette, together with papers on Air Hose, Caboose Air Gage and Conductor's Valve, Electro-Pneumatic Signal System for Passenger Trains, Modern Train Building, and the report of the committee on Recommended Practice. Other subjects discussed were the Clasp Type of Foundation Brake Gear for Heavy Passenger Equipment Cars, and One Hundred Per Cent Efficiency of Air Brakes. A tribute to George Westinghouse is also included in the proceedings. By prompt action of the executive committee immediately following the convention in Detroit, the secretary has been able to include in these proceedings the list of subjects selected and the committees appointed to report at the twenty-second annual convention, which will be held in Chicago, May 4-7, 1915.

COMMUNICATIONS

THE SPECIAL APPRENTICE

Port Jervis, N. Y., August 10, 1914.

To the Editor:

Owing to his college training the special apprentice is able to do many things of value outside of routine machine shop work and frequently this prevents his obtaining more practical experience. The apprentice of this class should be given a chance to learn his trade and not be sent out on all sorts of testing work, except for a short period of his course. The college man of the right material is willing to work and to learn and should be subject to the same rulings as a regular apprentice. The trouble is that the selection of a special apprentice is not made very carefully; no young man who has not graduated from a recognized technical school should be even considered. He should be given a six months' trial period and carefully watched; then if in the opinion of the supervising officer, he is unfit for the work, he should be told so definitely and not left to drag along till he gets discouraged and quits of his own accord. If a proper selection is made by a careful officer, the railroad will obtain a young man who has spent most of his life studying and surely it can well afford to devote some effort to educate him further along its lines of work.

R. W. Rogers,
Instructor of Apprentices, Erie Railroad.

HANDLING METALLIC PACKING IN ROUNDHOUSES

Chicago, Ill., August 17, 1914.

To the Editor:

The writer, having visited most of the railroads in the United States and Canada and observed the different practices in use in handling metallic packing matters, more especially in the roundhouses, has come to the conclusion that, especially at all large roundhouses, it will be found to be one of the best paying propositions to have a good machinist assigned to do all the packing of piston, valve and air pump rods. If such a man is on to his job, he can more than save his wages very easily. It is reasonable to suppose that the man who is held responsible will see to it when he packs a rod that that rod is packed in the best possible manner to insure its running without blowing until the packing is fully worn out. He will see to it that the equipment is in good shape and the swab is well lubricated, as he will realize that if his work is not properly done he will have the same job to do over again. The packing man should be furnished a small pocket record book wherein he should keep a complete record of all rods packed during the day. A printed form should then be used in reporting all rods packed during the week to the division master mechanic each week. These records would indicate, should an engine be packed quite often, that something was wrong. Investigation would show why so much packing had been applied and the proper remedy to overcome the trouble would then be applied.

In other words, the packing man would become a specialist in his work. He certainly would try and make a showing. To do this he would make his business a study. He should be encouraged as much as possible by the roundhouse foremen and others who would see that guides, pistons, etc., were kept in good condition. On a few roads it has been found advisable to have a monthly inspection of pistons, piston rings, etc., on superheater engines. On such inspection days the packing man should also look over his packing and equipment and see that it is in good shape, this being the proper and best time to do any work necessary on vibrating cups, followers, etc. It will be found on a road where this practice is carried out and watched that there will be practically no packing troubles. If there are any, the division master mechanic can very easily trace them and stop the trouble. His weekly packing sheets will keep him advised as to just what is being done and what points are using the most packing. His clerk can make a monthly report for the general superintendent of motive power, if desired, but the main object and result would be that the rods will be packed right and a great deal less packing used.

A. E. M.

THE DRAFT GEAR PROBLEM

Eastern State, September 14, 1914.

To the Editor:

I have read with much interest the various articles on draft gear which have appeared from time to time in your journal. Some of them have spoken in favor of the friction gear and others have been in favor of the spring gear. No doubt both types of gear have their good points, but is there any draft gear on the market today that will meet the requirements imposed upon it? I believe the answer is, NO.

Some manufacturers of friction draft gears claim that their gears have a capacity of 300,000 lb., which no doubt is true when the gear is tested on a static machine, but the conditions of actual service are entirely different from this and there is therefore no comparison between them. The only way in which a friction draft gear can absorb the energy of the blow imposed upon it is by changing that energy into another form of energy, namely, heat.

The question, therefore, resolves itself into the problem of getting a gear which will transform into heat the greatest amount of energy in the shortest time and still be elastic enough to take care of the minor shocks which cars are continually receiving.

The element of time is one of the most important factors to be considered. Draft gear designers have, in most cases, limited the travel of the gear to the same as is used with a spring gear. The only way in which the time used in absorbing the shock can be increased is by increasing the travel of the gear and some day we will see gears with seven to ten inches of travel. A loaded 50-ton capacity car running 10 miles an hour will develop 450,000 foot-pounds. If this total amount of energy was transformed into heat in the time that it takes the draft gear to travel 2¼ in. at the above speed, and with the small wearing surfaces at present used in friction gears, the entire gear would be welded together.

I have talked with several friction draft gear men and have asked them all the question, "If a blow of 100,000 foot-pounds is delivered to your gear, what part of that 100,000 foot-pounds is absorbed by the gear and what part is transferred to the draft gear supports?", and not one has been able to answer it.

The drop test is now largely used in an endeavor to duplicate, in the laboratory, actual service conditions, and I believe these tests clearly demonstrate one great fault existing in some of the present friction gears. This is that the angles of the friction blocks are such that the blocks move a relatively great distance with a given movement of the coupler. The movement of the blocks is restrained by springs, and when a blow is delivered to the coupler this is what takes place: the friction blocks move at a high velocity and their inertia overcomes the resistance of the springs and compresses them, and the pressure between the blocks is reduced. As the time consumed is but a small fraction of a second, the gear has completed its full travel and the coupler horn has come in contact with the striking plate and the major portion of the blow is delivered to the car underframe before the springs can overcome the inertia of the friction blocks and force them back into contact or normal position.

Conclusions.—What is needed in a friction gear is springs to take care of the minor shocks and encased friction blocks not depending on springs for contact, but relying upon the force of the shock to hold them in contact. The whole to have a total travel which will give sufficient time to transform the energy of the shock into heat. The friction surfaces must also be of such size as to safely conduct the heat generated to other parts of the gear.

Mechanical Engineer.

TRAVELING ENGINEERS' CONVENTION

Discussion on Locomotive Operation, Air Brake Maintenance, Mechanical Stokers and Speed Recorders

The twenty-second annual convention of the Traveling Engineers' Association was held at the Hotel Sherman, Chicago, September 15 to 18, E. P. Roesch, El Paso & Southwestern, presiding. The convention was opened with prayer by the Rt. Rev. Samuel Fallows, Bishop of the Reformed Episcopal Church.

ADDRESS OF J. F. DE VOY

J. F. De Voy, assistant superintendent of motive power, Chicago, Milwaukee & St. Paul, addressed the convention in part as follows:

This association must go farther in its efforts to handle railroad business with the least possible amount of expense, before it has entirely fulfilled its obligations, not only to the railroads, but to the entire country. Railroad earnings have continued to make an unsatisfactory showing. Gross earnings of all roads so far reported for the first seven months of the year are 6 per cent below the same period of 1913. The falling off in earnings has taken place in all parts of the country and on nearly all roads. The small freight rate advances permitted by the recent ruling of the Interstate Commerce Commission will not be sufficient to change this situation to any appreciable degree. During the past five years freight rates per ton mile have decreased about 4 per cent, while the average daily wage of railroad employees has increased about 14 per cent. This leaves an item of something like 250 million dollars to be offset by more economical management. We are not prepared to believe that the management of railroads generally has been so profligate that 250 million dollars can be saved in a year by better management, and this without in any way crippling the service.

There is no question that your association has helped by better methods and management to make up some of the losses in the earnings due to increased taxes and higher rates for material and wages, but the fact still remains that the difference between the expenditure and earnings of the railroad companies from different causes has been unsatisfactory.

Until such time as organizations similar to yours take a hand in the management of affairs other than those directly pertinent to your business, there will be no true equalization of the difficulties which it seems to me must come to all railroad business. It is this condition which all who are working along lines to better general conditions must keep uppermost in mind, and do their share to educate the people up to a full and proper understanding of the true conditions that prevail in your line of business.

It was about 25 years ago when the first traveling engineers were used on the railroads in this section of the country. The change from a few to many enginemen on any specified division brought about a condition where it was impossible for the master mechanic and the superintendent to come into as close contact with the individual engineman as was necessary for economical and safe operation. These conditions were responsible for the creation of the position of traveling engineer. On some roads this position has been developed until the title "Traveling Engineer" would not fit in with the duties of the position and they have more properly applied the title "Road Foreman of Engines."

In order that an engineer may become a successful traveling engineer, it is very evident that he must be able to do many things well that are not required of a man running an engine. The motive power officers who have the selection and appointing of traveling engineers must give this question a great deal of thought in order to get men for the place who will be able to do the various things required in a satisfactory manner. The man selected must himself be capable of doing what he expects of the enginemen he is instructing and he must be able to do this in a manner which will not tend to antagonize the enginemen and to get from them their best possible efforts. He must be a man in whom his superior officers have absolute confidence, so that when he makes a report on an engineman in the operation of an engine, or the performance of any locomotive or special equipment, it will be received as representing actual conditions and considered as final.

Opinions differ greatly as to the territory, the number of engines and men which should be assigned to any one traveling engineer. It is my opinion that best results are obtained with a system making it possible for traveling engineers to ride with each crew and engine at least once a month. His territory should not be so great but that he can get to any part of it in a few hours. Very often an engine crew makes a poor performance due to error in judgment, and where it is possible to have a traveling engineer ride with that crew on its next trip, a correction can be effected and subsequent delays or trouble avoided.

In looking over the requirements of some roads, I note that the same burden of making numerous written reports is imposed upon traveling engineers as on the other officers. The fewer reports required, the better results. It is much more satisfactory to motive power and operating officers to secure a short report from a traveling engineer advising of corrections made or matters adjusted, than to have a long detailed report of every move made. A traveling engineer who can himself improve conditions is much more valuable to any railroad company than one who is continually telling his superiors what someone else in another department should do. A traveling engineer should keep in touch at all times when on the road with the train despatcher, so that in case anything occurs, requiring his services, he can be promptly notified. He should keep in close touch with the roundhouse foreman and the roundhouse force and when he finds a locomotive which requires attention, he should not be satisfied by making a report to the foreman, but he should stay around and see that the work is done. There are altogether too many reports being made by all classes of officers and not enough attention is being given to the bettering of bad conditions instead of only writing about them. I do not believe the best results are obtained by having the traveling engineer spend too much of his time investigating cases of failure and delay. He can do more good working with the men in lining them up to prevent similar failures and delays. It has been said that the roundhouse foreman and the train despatcher run a railroad. It is true that what a good trainmaster is to the operating department, a traveling engineer is to the motive power department.

PRESIDENT'S ADDRESS

Since last we met several events of serious import have transpired. I refer to the war in Europe, the threatened railway strike in this country and the tentative settlement of the Eastern railway rate case. Of these the final outcome of the first is as yet problematic. The second is in the process of settlement by arbitration. The influence of the third, however, is much with us and demands our serious consideration. While a few slight increases were granted outright the commission seemed to infer that the railroads could more readily increase their earnings by indicated operating economies than by an arbitrary increase in rates. As a matter of fact, the railroads have for years been working along the principal lines suggested by the commission, and while the results have been encouraging they have not by any means been so easy of achievement nor as remunerative as the commission

appears to think possible. Be that as it may, the only recourse left to us is to make the best of it and try by every means in our power to carry out such of the recommendations as come within our province. In our own particular field of work we are primarily interested in the problem of transportation and the efficiency of the machines handling it. We find in late years that the railroads have adopted every known mechanical appliance that increases the efficiency of the locomotive and at the same time has a tendency to decrease cost of operation, but regardless of the increased efficiency of the machine in the final analysis we arrive at the old, basic principle that the performance of the machine depends upon the man operating it. As conditions are rapidly changing men must change or be changed to meet the new conditions. This means more and closer supervision and a higher degree of initial training. In employing new men to fill the ranks hereafter more attention must be paid to their mental than to their physical qualifications, and before any new men are placed in service they should be thoroughly grounded in the principles and manipulation of such appliances as come within their line of work, so that on their initial trip they can in return for a journeyman's wage render approximately a journeyman's service. Under the conditions prevailing on the majority of American railroads today it takes fully one year before the average student becomes what might be termed a fairly good all round fireman. This being the case, it must follow that during his probationary period or learning time his work represents a distinct loss to the company as compared with that of the experienced man. The same may be said to be true in a measure of many of our newly promoted engineers. Therefore, if the aspiring student be given a thorough preliminary training before he is ever placed in service and this training be then continued throughout his firing period with a view of fitting him for the position of engineer, there is no question but that the losses incidental to the student period, that is, the first year's service, in either capacity, could be almost wholly eliminated. With the increase in size of the modern locomotive and train and the refinement of operation made necessary, the losses due to unskillful handling are being rapidly increased and multiplied. These losses we wish to avoid by correct training. Several railroads have already a practically similar plan in effect and it is only necessary to call attention to some of them, as, for instance, the Erie, to show what supervision and training can accomplish toward a reduction in expense.

You have no doubt noticed that most of the items as suggested by the commission, if carried out, would involve some increase in initial expense, and the plan here outlined would in the beginning result in increased costs due to increase in supervision. It may, therefore, be a rather difficult matter to induce some of our managements to increase present expenses on the promise of future economy, but to my mind this is the only solution of the particular problem, namely, if we wish to increase the efficiency of the service we must first increase the efficiency of the men performing that service. This I believe is the longest step that we can take toward carrying out the recommendations of the commission.

Another item whereby some saving may be effected is to have enginemen inspect for and report such defects as come under the rules of the boiler inspection and safety appliance bureaus. This would entail no extra work on the part of the enginemen and might at some time avoid a violation of the law or at least an expensive delay.

ADDRESS BY H. C. BAYLESS

H. C. Bayless, mechanical enginer, Minneapolis, St. Paul & Sault Ste. Marie, addressed the association on Wednesday. He spoke of the increasing importance of the traveling engineer. The higher mechanical officers have become so loaded down with routine reports and investigations required by the government that the actual mechanical department work is being done by their assistants. For this reason the traveling engineer has a good opportunity to broaden himself in mechanical department work. He must be prepared to make efficiency studies of the various new mechanical devices applied to locomotives and seek data and information on fuel economy, valve gears, and such things for the good of the service. From his wide experience of locomotive operation he should be of assistance to the drawing office when new engines are being designed. The highest efficiency in operation has become necessary in order to meet the decreasing revenues and adverse legislation, and this alone presents a wide field for the ingenuity of the traveling engineer on his own road.

ADDRESS BY FRANK MCMANAMY

Frank McManamy, chief inspector of locomotive boliers, Interstate Commerce Commission, addressed the association Wednesday afternoon, calling attention to the many ways in which the traveling engineers and the government inspectors may be of assistance to each other. Attention was called to the increasing number of locomotives inspected by the 50 government inspectors, and the decreasing number of locomotives found defective, which is a credit to both the inspectors and the railroads. In the year 1912, 74,234 locomotives were inspected, of which 65.7 per cent were found with reportable defects; in 1913, 90,356 locomotives were inspected and 60.3 per cent were defective, and in 1914, 92,716 locomotives were inspected, of which 52.9 per cent were found with reportable defects. All of these, however, were not in direct violation of the law. Those that were in violation represented 4.5 per cent in 1912, 5.2 per cent in 1913, and 3.6 per cent in 1914, of the total number of locomotives inspected. The number of and results from accidents have also decreased during this period, as shown by the following reportable accidents due to the failure of locomotive boilers and their appurtenances:

Year	Number of accidents	Number killed	Number injured
1912	856	91	1,005
1913	820	36	911
1914	516	21	574

It was believed that these figures represent the results of the inspectors and the effect of the law. The greatest trouble with accidents has been with the failure of arch tubes and four out of every five of the accidents are caused by the improper application. The careful cleaning of them is also of vital importance.

All roads should insist on a proper inspection of the locomotives before they leave the terminal, and some roads provide blanks to be filled out by the engineer for this purpose. Some difficulty is being found in having the boilers washed out properly. All wash-out plugs should be removed at every washing and the work should be done in a thorough manner. The government inspectors want to co-operate as much as possible with the railroads in correcting defects, and so far have found that most of the railroads are anxious to co-operate with them, so that it has been unnecessary as yet to file suits in the courts regarding the violation of the boiler inspection law.

SMOKE PREVENTION

In order to eliminate dense black smoke, three conditions must exist, viz., to supply the fire with sufficient air, to thoroughly mix the combustible gases and air, and to maintain the temperature in the firebox to cause the combustible gases and oxygen of the air to unite. It is found that inadequate draft is usually responsible for smoky chimneys; therefore it is evident that it is necessary to have a properly designed front end, including the exhaust nozzle, ample grate opening, and ashpan opening large enough to insure free access of air. Grate opening is more generally found to be restricted by clinkers than by faulty design. Trouble is sometimes caused in properly designed front ends by air leaks in the smokebox. The effort to overcome fires along the right-of-way has resulted, to some extent, in restricting the air opening in the ashpan. The ashpan openings are frequently permitted to fill up with ashes, especially in winter on account of freezing. The smaller the amounts of coal fired at a time the better the results obtained.

If heavy charges of coal are applied, there will not be sufficient air to mix with the volatile matter and the temperature of the fire will be materially reduced. The brick arch is a great aid in smoke elimination, as it increases the travel of the gases and gives them a chance to combine with the oxygen of the air before coming in contact with the comparatively cool firebox sheets. When fresh coal is applied, the steam jets, beside giving a small mixing effect, are helpful in furnishing the necessary air over the fire. They require the constant attention of the fireman, because if they are not closed after the volatile matter is burned off they will inject a surplus of cold air which will have a tendency to reduce the temperature in the firebox.

Special effort should be made to furnish a uniform grade of coal because it is hard for the best fireman to obtain the best results with a grade of coal which is continually changing. Better results will be obtained if an inferior grade of coal is furnished at all times, because where it is changed frequently the locomotive is drafted to burn the inferior grade and the better grade is wasted.

Locomotives must be maintained in good shape at all times to enable the crews to eliminate smoke. Of course this costs money, but it pays in the long run on account of the efficiency obtained when this is done. Minor defects must be looked after and there is no question but that it is a paying investment because it prevents engine failures and increases the engine mileage between shoppings.

The following is taken from a letter from F. R. Wadleigh, of the firm of Wadleigh & Osborn, consulting engineers, Philadelphia:

"The European railways pay much more attention to firing than we do; their men are more carefully instructed, the observance of proper methods is strictly enforced, and every appliance is made use of that will decrease fuel consumption. Then, they are much more particular as to sizes of coal used. For instance, on the French railways, each class of service has its locomotive fuel carefully divided as to lump and slack or briquettes and slack by weight; passenger service uses 20 per cent slack and 80 per cent lump or briquettes; fast freight 40 per cent slack; yard engines, 80 per cent slack.

"The through trains of France and Germany run further without stops than do our trains, which is a factor in fuel economy and smoke prevention. The longest non-stop run in Germany is 106 miles at 44 miles an hour, while in France the longest is 203 miles at 47.6 miles an hour."

The report is signed by Martin Whelan, chairman, A. M. Bickel, P. K. Sullivan, W. A. Heath, and B. J. Feeny.

DISCUSSION

The substance of the discussion of this subject was a statement made by John McManamy to the effect that a properly designed engine with a properly instructed engine crew is necessary if smokeless firing is to be obtained. Without a properly instructed engine crew the beneficial effects of the various smoke eliminating devices will not be fully realized. The proper opening in the ash pan is believed to be from 90 to 100 per cent of the tube area and the opening through the grates should be as large as consistent with good grate design. A. G. Kinyon believed it should not be lower than 46 per cent of the total grate area, and cases were cited where as much as 56 per cent had been obtained. At all events atmospheric pressure should be maintained in the ashpan. The representative of one road stated that a saving of 20 per cent in fuel had been obtained in increasing the ashpan opening.

One shovel at a firing was recommended by most of the members, and in order to encourage the firemen to follow this practice the fire door should be properly hung and maintained, so that it can be operated with the least amount of effort. A member from the Buffalo, Rochester & Pittsburgh spoke of the smoke box damper that is applied to 50 per cent of the locomotives on that road. This damper controls the opening by the deflector plate and has three positions—open, partly open and closed. This has been found to permit of fuel economy, especially when the engine is drifting or at rest, and in long hard drags where the damper can be used to decrease the full force of the draft which would tear holes in the fire. This arrangement was described in the Railway Age Gazette of February 14, 1913, on page 297. The brick arch and steam jets were spoken of as giving great assistance in smoke elimination.

MECHANICAL STOKERS

The advantage to be derived from stoker firing of locomotives is the ability to fire the engine continually up to its capacity, and it is found that the stoker-fired locomotive can either take the same tonnage as the non-stoker over the road in less time, or a larger train can be handled in the same time. As a concrete example of this fact we note that in a recent test for the capacity of locomotives a stoker-fired engine was operated for six hours, firing an average of 7,800 lb. of coal per hour, which means a continual capacity of the locomotive firing in excess of that which could be maintained by hand firing.

It has also been demonstrated that mechanical stokers have permitted the enlarging of the exhaust nozzle. The principal reason that permitted the increasing of the nozzle is the keeping of the fire-doors closed, thus preventing the inrush of cold air which takes place when doors are opened for hand firing. Other advantages are obtained by not opening the fire-doors, viz.: doing away with the glare or dazzling light which is produced after dark and which makes the observation of signals more difficult. It also prevents sudden change in firebox temperature which produces contraction of sheets and tubes.

A properly adjusted mechanical stoker will reduce the use of a firehook or rake on the fire bed, as the distribution of coal can be regulated to prevent banking. This is an advantage, as the frequent use of the rake disturbs particles of fuel which are carried by the draft onto the brick arch or lodged in the tubes, reducing the draft and the heating surface, and causing loss of fuel. The application of the stoker has proved to be a benefit from the standpoint of smoke abatement and there are some stoker locomotives at present being used in the heavy transfer service within the limits of large cities, resulting in practically complete elimination of smoke. Although all types of stokers are not showing an improvement in smoke prevention, the good results of some types indicate that future developments may be expected to produce good results along this line.

The firemen engaged in stoker firing do not have to devote as much time and attention to the use of the methods employed in hand firing, but are required to operate the mechanical stoking machine which furnishes them with a practical experience in the care of steam driven machinery. This mechanical education should greatly aid in the development from fireman to locomotive engineer.

The report is signed by W. J. H. De Salis, Chairman, S. V. Sproul, O. E. Whitcomb, T. B. Bowen, O. B. Capps, T. B. Burgess, H. F. Hensen, and A. L. Lopshire.

DISCUSSION

All members who have stoker engines on their lines reported that they have been found very successful, especially from an operating standpoint. Numerous cases were mentioned where it had been possible to increase the tonnage by the adoption of the locomotive stoker. Much better service is obtained from the crew of a stoker engine and the number of firemen required has been materially reduced on those roads having a number of stokers in service. However, a mechanical stoker cannot be allowed to make failures, as it is extremely difficult to build up a fire by hand when a stoker fails, without allowing the steam pressure to drop an appreciable degree, as the fire the stoker carries is so light.

The Baltimore & Ohio has increased the efficiency of their en-

gines on the second division between Brunswick & Cumberland 15 to 20 per cent by the use of a large number of stoker engines. It was stated that the stoker engines on that road are as economical as the hand fired engines in regard to fuel. On this division no train has been delayed 5 minutes on account of the locomotive for 45 days prior to September 15. Results of tests read by E. A. Averill of the Standard Stoker Company, showed that the stoker maintained an average evaporation of 6.52 lb. of water per pound of dry coal whereas the hand fired engines averaged 6.37 lb. water per pound of dry coal, the tests being comparative in every respect.

Another big advantage mentioned for the stoker was that when once adjusted it was not necessary to rake or hook the fire, several instances being mentioned where stoker engines had made their full trips without having the fire door opened. A Hanna stoker on the Carolina, Clinchfield & Ohio has run in pusher service for 30 days without a hook being put in the firebox. Mr. Averill mentioned a record of 8,310 miles, over two months' service, on the Norfolk & Western where the fire had not been hooked. It was pointed out that a cheaper grade of fuel could be used on a stoker engine, but several members have found that it can be too poor. Tests on the Baltimore & Ohio have shown that nut, pea and slack, a gas coal mixture, gives better results than run-of-mine and slack.

The stoker firemen have less real hard work to do and find more time to study for the progressive examinations for engineers. They also receive a training in the handling of machinery that better fits them for the position of engineer.

LOCOMOTIVE BRAKE EQUIPMENT

The care of locomotive brake equipment on the road is something in which the engineman, trainman and car inspector is concerned. The compressor, being the source of supply for the air brake, signal system and other air operated devices, should be given the most attention. In starting the compressor, always run it slowly until it becomes warm, and with drain cocks open, allowing the condensed steam to escape in order to provide an air cushion. The lubricator should not be started until all condensation has escaped and the drain cocks are closed. Then start the lubricator and feed in ten or fifteen drops quickly, after which regulate the feed to the amount desired while the compressor is running. Particular attention must be given the high pressure air cylinders of compound compressors, as to oiling, as the cylinder is liable to become overheated if neglected, on account of the two stage method of compression.

Compressors should be shut off when cleaning the fires, or dumping the ashpans, except on engines equipped with an air operated reverse gear, or where the engine might move on grades. The brake pipe leakage should not be over five pounds per minute. The engineman should from time to time note the increased compressor labor necessary to operate the engine brakes, and the various air operated devices on the locomotive; if the labor is abnormal, the leaks should be located and repaired.

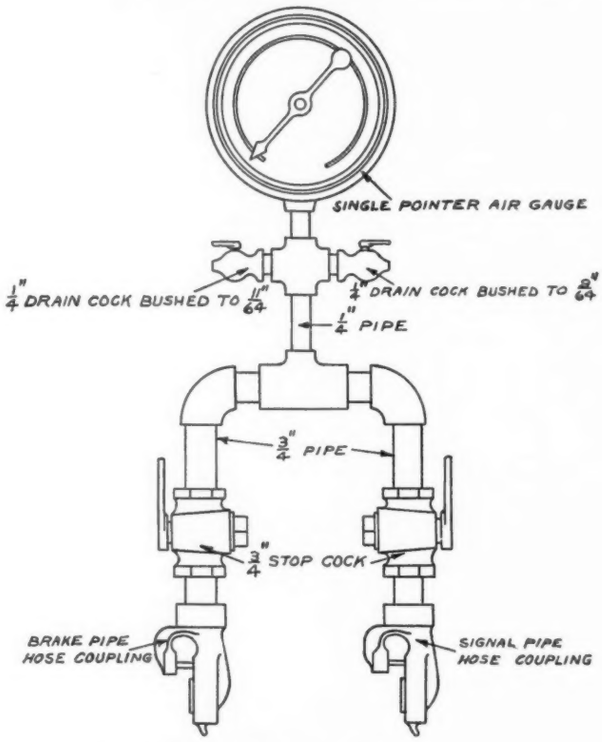
The main reservoir should be drained every day. It is very important at any time, but more particularly so in freezing weather. The accumulation of moisture in the main reservoir is hastened by any steam leaks around the compressor, particularly from piston rod packing or from any portion of the boiler where the rising steam can reach the air inlet.

When leaving an engine under steam outside the roundhouse in freezing weather, the brake pipe and signal line stop cocks at the rear of the tender should be opened, and the compressor run slowly—just fast enough to maintain circulation through the air pipes, but not fast enough to cause the pistons to strike the cylinder heads. Triple valves, distributing valves, drain cups, etc., should be drained daily. The practice of using the automatic brake valve in emergency in handling light engines, or in switching, should be discouraged.

The engineman should school himself in observing the gage frequently to guard against the pressure becoming too high, or leaking away unnoticed. He should also watch the gage during brake operations to note the effect of the brakes. The incoming engineman should make a thorough inspection, reporting the needed repairs, and the outgoing engineman should, before leaving the vicinity of the roundhouse, determine whether the apparatus is in proper condition to make the trip.

Much of the information necessary to properly report the condition of the various parts of the brake and signal system can be obtained before the terminal is reached, remembering that the man operating the equipment is in a better position to determine defects by its erratic action than is the machinist who will probably make repairs while the locomotive is dead in the roundhouse, but should the engineman be unable to definitely locate any defects manifested he should describe on the report book the manner in which the defective apparatus operates.

The care of locomotive brake equipment at terminals is most important in order to reduce the liability of failures resulting in delays on the road. Inspectors and repairmen should be


SINGLE POINTER AIR GAUGE
1/4" DRAIN COCK BUSHED TO 11/64"
1/4" DRAIN COCK BUSHED TO 8/64"
1/4" PIPE
3/4" PIPE
3/4" STOP COCK
BRAKE PIPE HOSE COUPLING
SIGNAL PIPE HOSE COUPLING
NOTE: MAKE AS COMPACT AS POSSIBLE.

Testing Device for Locomotive Brakes

provided at the principal terminals on all divisions, to inspect, test and repair air brake equipment on locomotives. This should include the complete equipment from the compressor to the brake shoes.

The practice of merely noting that the compressor accumulates pressure in the main reservoirs, without considering volume or time, and that the brake applies and releases, is not sufficient under modern operating conditions to insure against delays after leaving the roundhouse. Hostlers should be required to open the main reservoir drain cocks, also the compressor drain cocks when the engines are placed in the roundhouse.

Air gages should be tested and compared with a master gage at least every 90 days. No freight or passenger engine should leave the roundhouse without the brake and signal system being thoroughly tested out, and all defects corrected. The foundation brake gear on locomotives and tenders should be given such attention as will insure the proper length of rods, levers and piston travel being maintained, to equally distribute the braking power, and to maintain the braking power at its maximum.

Worn rods, levers, hangers, pins, keys, etc., should be renewed before they fail.

Tenders on modern locomotives are heavier, when loaded, than the locomotive itself of a few years ago, weighing in some instances over 100 tons. It is necessary then that the braking power be maintained at its maximum in order to reduce draft gear strains, liability of wheel sliding and to provide smooth handling of trains as far as possible.

Enginemen should in no way be relieved of responsibility for properly inspecting and caring for brake apparatus while in their charge, or for properly reporting all existing defects on arrival at terminals. All defects should be reported by incoming enginemen on work book or forms as provided. Defects found by inspectors should be reported on forms or slips, and delivered to foremen or repairmen, a record being kept.

The committee is unanimously of the opinion that the brake equipment should be taken care of by repairmen at terminals, they to make such tests and inspections as will disclose any defects, and correct them without waiting for the enginemen to report them. Along these lines the assistant to the vice-president (in charge of mechanical matters) on one of our large railroads issued instructions that the compressors and other brake equipment on freight and passenger locomotives should be tested each trip before the locomotive left the roundhouse for the train. In order that the inspectors might know how extensive their work of testing out the brake and signal systems should be, they were provided with a code of tests, and were instructed that all defects must be corrected before the locomotive left the roundhouse. They were also provided with a sketch showing a simple test device that could be assembled quickly and cheaply at any terminal, made up of the ordinary fitting usually found in storehouses.

The object of making these tests before the locomotive went to the train was to maintain the locomotive brake in condition to avoid as far as possible failures and delays, and it has resulted in compressor failures being reduced from 231 in 1912, to 123 in 1913. These failures are the result of all the defects that compressors are subject to, and of delays ranging from five minutes to total failures, or giving up trains.

The best results are obtained in lubricating the air cylinders of duplex pumps by using a good grade of valve oil (not superheat valve oil) in an automatic oil cup. At important points the air brake repairman should keep on hand several automatic oil cups and air strainers. The oil cups and air strainers removed should be placed in lye and boiled out. Keeping the intake to the air strainer clear is of the utmost importance, as a slightly clogged strainer will greatly reduce the capacity of the pump when the speed is at all fast.

When pumps are equipped with auxiliary air cylinder oilers, which are connected with the main lubricator in the cab, oil should be supplied intermittently. The amount of oil to be used at one oiling and the time between oilings should be governed by the requirements of service. When superheat valve oil is used in the main lubricator, the standard automatic oil cup should be used instead of the auxiliary air cylinder oiler. Care should be taken not to use more oil in the cylinders than is necessary, as too much oil clogs the valves and passages and lessens the pump capacity. A swab well oiled is essential on the piston rod.

[The report also contained complete detailed instructions for the testing and care of the air brake equipment.]

The report is signed by G. H. Wood, chairman, B. Hyanes, R. E. Anderson, W. V. Turner and E. Bales.

DISCUSSION

It was pointed out that although the air brake was a dividend producer in the matter of permitting a greater density of traffic if it is not properly maintained it could be made very expensive for a railroad. Extra parts of the air brake should be kept in stock in good condition, so that they may be readily used in replacing defective parts. This will permit of taking the defective parts to the shop, where they can be repaired properly. It pays to keep the air brake in its proper condition. Special care should be taken to see that the centrifugal dirt collectors are properly cleaned. The engineers should be encouraged in reporting every defect to the air brake equipment. The traveling engineers should be so familiar with the air brake that they will be able to answer any question the engineers may ask. On the Santa Fe the traveling engineers are required to have a clear understanding of the air brake. Mr. Wood in his closing remarks laid particular stress on the importance of maintaining the feed valve with No. 6 E T equipment in perfect condition to prevent the engine brakes creeping on.

EFFICIENT OPERATION OF LOCOMOTIVES

Realizing the innumerable angles from which this subject might be reviewed, and the varying conditions surrounding locomotive operation, the committee has sub-divided the original subject into nine parts.

Assignment of Power.—To obtain maximum efficiency at minimum cost the matter of assigning power should be made with due consideration of both operating and mechanical points of view, observing not only the physical condition of the roadbed and bridges, the capacity and fitness of terminal facilities for the care, up-keep and turning of the power assigned, but also its adaptability to meet the requirements of service, either freight or passenger, taking into consideration the weight and schedule of trains.

Classified Repairs.—The cost involved by the early shopping of power may be an item of profit or expense depending largely upon the general condition of the engine and the service required, also the demand for power. In some cases badly worn engines may successfully and efficiently fill a requirement provided the work is sufficiently light. The most profitable time for shopping power depends largely on local conditions. Density of traffic in some localities with many high class freight trains, and other important traffic with an increasing public demand for better service, would not warrant the working of power in other than first class condition, while branch lines, unimportant freight or switch service, may provide suitable places to obtain additional wear from locomotives between shoppings.

Power received from the general repair shops after overhauling should be known to be in perfect condition before being returned to the operating department for service. The power should be well broken in before it is placed in its regular service. Attention is called to the increased cost of operation where scale is allowed to accumulate on the tubes or boiler shell, causing an increase in fuel consumption, an increase in the use of steam by excessive use of the blower and in some cases leaky tubes or firebox sheets which result in engine failures or delays.

Boiler Attachments.—Location of all boiler attachments for safety, accessibility and convenience of operation and repairs, is a matter which may appear to some to be of small importance yet may involve great expense. An injector or lubricator placed beyond the convenient reach of the engineer does not receive the attention and fine adjustment that economical service would demand, or that it might receive if properly placed. Sander valves, hydrostatic flange oilers and other boiler attachments are equally important.

The best results are obtained by locating the lifting injector with the center line of the injector on a line with the top of the tank whether placed inside or outside of the cab. The non-lifting injector is mounted below the bottom of the tank and is usually placed on a bracket mounted on the tail piece of the engine frame. A safer application (where it is possible) is to mount the injector on a bracket suspended from the bottom of the mud ring. This would place the injector pipes under the same influence of expansion and relieve the strain from the steam pipe and connections.

If a regular feed of water to the boiler is maintained the steam pressure is more easily maintained and the liability of

boiler leaks is reduced, because there is no rapid expansion and contraction in a boiler when the supply of water is regular and an even temperature is maintained. In maintaining an injector, first, see that it is properly repaired and the tube sizes maintained to a good standard. Also see that the tubes are kept free from lime. All of the pipe joints must be kept tight. The proper way to apply a lubricator is to follow the instructions issued by the manufacturer. If this is done you will have the application right for that particular make of lubricator. Also follow the instructions regarding its operation.

Terminal Inspection.—A record should be maintained of the assignment of work to workmen with a view of fixing responsibility for improper repairs. Engines permitted to work when lame or with steam leaks in the smoke arch, valves or cylinder packing blowing, or badly stopped tubes, may use extra fuel by the ton while enginemen are striving to save by the pound. Engines should be so drafted that they steam freely; their arches, steam pipes, superheater units, cylinder packing and valves should be known to be in perfect condition. Periodical inspection should be made of all draft appliances and a perfect measurement maintained of the sizes of the exhaust nozzles, location of draft sheets, etc. By so doing much time and expense can be saved where readjustments are necessary or for comparison of work with other power of the same class.

The cost of maintenance and up-keep of power can be greatly reduced with an increasing benefit and training to enginemen by the enforcement of strict rules requiring close inspection and properly defined work reports from them. Some railroads require both engineers and inspectors to inspect and make separate work reports with a view of reducing the chances for delay or accident. Engineers should be in a better position to locate and report necessary work than an inspector who only sees the engine at rest. Where engineers are relieved at points remote from the engine house or where busy terminals do not allow time for the engineer to properly inspect the engine on its arrival, small work books can be carried on the locomotive in which the engineer should note the needed repairs, delivering the book with the engine at each terminal.

Locomotives should be fired up sufficiently early to insure testing of the air pump, headlight, injectors and other boiler attachments, to know that all are in working order before delivering to the engine crew. Such precautions will avoid many delays and failures which amply justifies this work. Proper record of the time that engines are at terminals should be maintained. For such purposes the accompanying form will be found very convenient.

Superheaters and Brick Arches.—To insure a high degree of superheat it is necessary to keep all flues clean and free from clinkers or soot. It is equally important to know that the superheater units are free from leaks and the cylinder packing and piston valve rings are in good condition. Brick arches should be kept in perfect condition in order to insure maximum efficiency from their use. Locomotives drafted with the use of an arch will, as a rule, be more severe on fuel should the arch fail and the locomotive be run without it.

Engine Crew Examination.—In selecting, promoting and employing new firemen, care should be exercised to secure men of good habits, possessing at least a common school education. They should be required to pass an examination and be given the necessary instructions to insure a knowledge and familiarity with the signals, rules and other important requirements connected with their duty. Many railroads are now using the first, second and third year progressive examination questions for the advancement of their firemen. Such examinations as a rule stimulate general interest, not only among firemen but among engineers as well. In all cases possible young firemen should be examined on the first year's questions shortly after six months' service as a firemen, and there should be some ruling from the master mechanic or officer in charge as to the disposition of those who fail or refuse to take the examination. Coaching and training enginemen is an important factor in paving the way for skillful and efficient service and should be encouraged by all officers.

Turning Power at Terminals.—There should be co-operation between yardmasters, despatchers and roundhouse foremen, in order to get the best results in turning power quickly. Other items of importance are the prompt placing of supplies, delivering the coal to the coal chute, pulling cinder cars out of the way, etc. Such duties should not be regarded as of secondary importance but should be promptly handled, as much depends on this service to aid in the prompt movement of power. Blocking roundhouse leads or delaying incoming power in the yards after its arrival is an item of expense too frequently caused by unnecessary blocking of tracks.

Efficient Handling of Locomotives.—The worst designed locomotive is made better by special care and handling, while the best designed locomotive will not do well if improperly handled or fired. Railroad operating costs are great, and the fuel bill is the largest single item of this expense, therefore, the largest field for loss or gain. Of this vast amount of fuel burned in

FORM M. P. 72 B LOCAL

ST. LOUIS & SAN FRANCISCO RAILROAD

JAMES W. LUSK, W. C. NIXON, W. B. BIDDLE, RECEIVERS

ROUNDHOUSE RECORD OF ENGINES HANDLED

FOR 24 HOURS ENDING MIDNIGHT _____ 191

_____ ROUNDHOUSE

ENGINE NUMBER	TIME OF ARRIVAL	TIME FIRE KNOCKED	FIRE CLEANED	FUELED AND WATERED	BOILER WASHED	WATER CHANGED	FLUES BOXED	WIPED	SUPPLIES HANDLED	FRONT END PAINTED	TIME FIRE BUILT	TIME OF DEPARTURE	TOTAL TIME UND. STEAM	TIME READY FOR SERVICE	MECHANICAL DELAY	TRANSPORTATION DELAY
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17

Columns 4 to 11—When operations as designated are performed, place check mark in proper columns. 3 to 12 to be totaled to show number of engines upon which various operations are performed. Column 14—Show time elapsed between entries in columns 2 and 3 plus time elapsed between entries in columns 12 and 13. Columns 15, 16 and 17—To be used by Round House Foreman only at such time as instructed by Master Mechanic.

INSTRUCTIONS:—This report is to be prepared by Roundhouse Foremen and must be completed the first thing each morning.

All engines handled must be shown, each class of service (Passenger, Freight, Switch, Work, etc.,) being grouped under suitable headings.

Six copies of this report must be made, one copy each for the Superintendent of Locomotive Performance at Springfield, Supervisor of Efficiency at Springfield, Chief Purchasing Officer at Saint Louis, the Master Mechanic and Superintendent of the Division.

These must be mailed on first available train after completion. Copy of the report must be retained in the Roundhouse Foreman's file.

Roundhouse Record of Locomotives Used on the Frisco

locomotive operation considerable of it does not come under the control of engineer or fireman, tests having shown that about 22 per cent is used for terminal consumption. Close co-operation should prevail between the heads of the transportation and the mechanical departments in the matter of ordering power and firing up before needed.

Engineers should have the lubricator properly set and feeding at least 15 minutes before starting on a trip. The engineer should strive to handle the locomotive in such a manner as to render the required service, working the engine at as short a cut-off as the service and grade will permit, remembering that steam represents fuel and money.

Locomotives having cylinders 26 in. in diameter, operating at a 6 in. cut-off use 12,620 cu. in. of steam; 8 in. cut-off, 16,960 cu. in, and 10 in. cut-off, 21,200 cu. in. for each revolution of the drivers. The amount used per mile would depend on the size of drivers; however, the foregoing illustrates the importance of the reverse gear and what it can do for the fireman or coal pile if properly handled. When the water supply is regular in keeping with the amount used and kept at a proper level or uniform height, tubes are not so liable to leak, the engine will steam better and use less fuel than when the feed water supply is irregular.

Locomotives may be kept in perfect condition at great cost, may be operated and fired 100 per cent perfect, loaded to full tonnage capacity, yet fail in good returns. The matter of hauling empty or half loaded cars of great weight and size increases operating expenses and proportionately reduces net returns, and therefore, should be a matter of mutual concern to every railroad in the land.

The report is signed by J. R. Scott, chairman, P. J. Miller, J. J. McNeil, W. L. Robinson, C. W. Hyde, F. W. Edwards, M. H. Haig and W. G. Tawse.

DISCUSSION

It was believed that too much attention could not be given the proper and convenient location of the various appurtenances in the locomotive cab so that the engineer may operate his engine with the least possible effort. Regarding the use of flange oilers some members stated that they had trebled the life of the tires and in some cases they had eliminated trouble from derailments.

The subject of superheaters was again very thoroughly discussed. The members were cautioned to keep the superheater flues clean and not to carry the water too high in the boiler if the best results are to be obtained. The wide open throttle and regulation by the valves was strongly recommended up to the point where it would be impractical to further shorten the cut-off, when of course the regulation should be done by the throttle. The throttle should always be slightly open when drifting unless other means are provided to take care of the cylinder lubrication. The Erie has eliminated the drifting valve entirely, so that it is now necessary for the enginemen to open the throttle slightly.

The question of pooled engines vs. regularly assigned engines was thoroughly discussed. The members were very strong in their approval of assigned engines. A member from the St. Louis & San Francisco stated that with the regularly assigned engines there was an average of 18,000 miles per engine failure in a recent six-months' period, as against an average of 6,000 miles per engine failure when the pooled system was in effect. He also stated that by changing from the pooled system to assigned engines there had been a decrease of 6 per cent in fuel used with an increase in tonnage hauled of 2.33 per cent. It was believed that in nearly all cases the engineers would take better care of their engines, and numerous cases were mentioned where the mileage between shoppings had been increased by adopting the assigned engine plan. While more engines are needed than with the pooled system it was believed that the additional investment would be warranted.

PRACTICAL CHEMISTRY OF COMBUSTION

Alonzo G. Kinyon, superintendent of locomotive operation, Seaboard Air Line, presented an interesting lecture on the chemistry of combustion, illustrating his remarks by chemical experiments and lantern slides. He stated that burning is the rapid chemical combination of anything with oxygen and the heat and light are the result of burning. It was explained that matter was divided into two classes, elements and compounds, the elements being defined as matter in its simplest form and compounds as substances that could be subdivided into elements.

A series of experiments was then performed to show that chemical changes were brought about by two general processes. Where two or more elements are brought together and combined, forming a compound, there is a building-up process which produces heat. Where a compound is treated chemically and separated into its elements, there is a tearing down process which absorbs heat. In burning the coal in the firebox it is necessary first to split the compound (coal) into its elements, thus producing a tearing down process which absorbs some of the heat from the fire. This is followed by a building up process in which the oxygen of the air combines with the fuel elements of the coal and burns, producing heat.

As an illustration of the tearing down process, a small quantity of red oxide of mercury was placed in a test tube. Upon the application of heat the oxygen or gas was driven off, leaving globules of mercury deposited on the inside of the tube. The presence of oxygen as it was driven off was demonstrated by taking a match with a small ember on its end and placing it in the end of the test tube. As soon as the oxygen came in contact with it, it started to glow brightly.

In demonstrating the building up process, a piece of magnesium ribbon was ignited and as it burned, giving off heat, a compound (magnesia) was formed in the shape of a powder, caused by the combination of the magnesium with oxygen. Another interesting experiment illustrating the production of heat was made by placing a small amount of sugar in a glass jar to which was added a small amount of sulphuric acid. There was an immediate change in the color and the bulk of the material in the glass, and a very noticeable amount of heat was produced.

Oxygen ignites with different elements at different temperatures, 1,800 deg. F. being necessary to burn the volatile gases in coal. The carbon in the coal will burn at 914 deg. F., and as the firebox temperature is usually about 2,300 or 2,500 deg. F. the main point is to get plenty of oxygen into the firebox. Without sufficient oxygen the heat loss is considerable, for when the carbon in the coal is not completely burned it passes off as carbon monoxide gas, which gives off only 4,500 B. t. u., whereas if it was completely burned to carbon dioxide it would give off 14,600 B. t. u., a B. t. u. (British thermal unit) being the heat necessary to raise one pound of water at 39 deg. F. one degree in temperature. The complete combustion of the carbon is further hindered because the hydro-carbon gases absorb the oxygen more readily than the carbon, so that the carbon has to depend on the oxygen that is left. Mr. Kinyon also showed some lantern slides on the proper methods of firing.

SPEED RECORDERS

Fred Kirby (B. & O.) presented a paper on speed recorders which was in part as follows:

We have in use on the railroads of the United States the following recorders: Boyer, Flaman, Hausshalter and Railway; and on some of the private cars we have what is known as the Hutchinson Electric and the Warner. The Boyer, Flaman and Hausshalter are the principal recorders used on locomotives and trains. The Boyer and the Flaman are more generally used on locomotives, and the Hausshalter is principally used on cars. The Hausshalter recorder is purely a mechanical device, the main shaft of which revolves only about 45 revolutions per mile, and when placed on a locomotive it enables the engineer to note at a glance the speed at which he is running, and besides records on the record tape the following information: Speed at all times from zero to 100 miles per hour; time of all stops; time between stops; time from start to finish of run; distance between stations or stops, and distance of run (total length).

It is also fitted with an alarm bell which can be set to ring automatically when any desired speed per hour is attained. The time-recording feature of the Hausshalter apparatus is a very valuable one, particularly from the engineer's standpoint, as it proves without a doubt the time of all detention and station stops and the distance from the starting point at which they took place, which shows up the train despatchers and station men when they are at fault, as well as slow movement on the part of tram crews.

The Boyer speed recorder is an oil pump arrangement and the main shaft turns about 540 revolutions per mile, and gives practically about the same information as all other recorders.

There are two devices called the electric annunciator that can be attached to speed recorders of any type that are not provided with the alarm bell. They consist of an attachment fitted to the machine itself with an electric bell, one or more dry cell batteries, and the required amount of insulated copper wire;

a low voltage electric light may be used if so desired. The attachment fitted to the machine may be so placed that the bell can be rung when any desired speed is reached and can be rung as long as the speed is exceeding the adjusted limit. It may be set to ring for two miles above the limit and if the rate of speed is more than two miles above the limit the bell will ring until the decreasing speed reaches and passes below the limit at which the device is set. One great advantage is that if the recording gage is broken or for any reason it is out of service the bell begins to ring when the speed limit at which it is set is reached.

It is claimed by the different members furnishing the data that one of the advantages derived from the use of the speed recorder is the factor of safety; it can also be used to advantage for a check on trains in the way of excessive speed, and from some of the recorders we can get the time of stops, and the number of stops on each trip. I also find that the speed recorder is a great factor in settling disputes in regard to speed at time of accidents. It has also been claimed that a great deal of benefit is derived from the use of speed recorders in the way of reducing heated bearings on engines and cars, as the engineers are more careful to observe the speed rules.

In some of the information received it is claimed that the fuel consumption has been increased on account of the speed restriction, from the fact that when trains were permitted to descend grades at a high rate of speed (from 60 to 80 miles per hour) and ascend the grades at a speed of from 30 to 45 miles per hour the fuel consumption was less than at the present time when they have to maintain a higher rate of speed on the ascending grade in order to make the schedule time.

One road gave an estimated cost for maintaining the speed recorders of from $120 to $140 per year for each machine in use, for material and labor. Another road estimates the cost of material and labor at $75 per year for each machine used.

DISCUSSION

Those roads using the speed recorders reported favorably as to their use, believing that derailments have been materially reduced, and have found that the number of hot boxes was decreased. The enginemen like them, as it gives them a guide by which they are better able to maintain schedule speed. A leeway of five miles per hour was believed fair before disciplining an engineer for a violation. The El Paso & Southwestern test the recorders in case of a violation of the speed limit before the engineers are disciplined, as the gages do not always register in accord with the record. All recorders should be carefully maintained, and on some roads the engineers are required to check the reading of the gage by taking the time between mile posts. If possible the recorders should be operated from the trailer wheel, so that it will not be necessary to have a long wire from the recorder to the gage in the cab.

OTHER BUSINESS

W. H. Corbett, chairman of the committee on the Revision of Progressive Examination for Firemen for Promotion and New Men for Employment, reported that a new book of rules has been made and will be distributed in the near future. The following is the list of subjects for 1915:

What effect does the mechanical placing of fuel in fireboxes and the lubrication of the locomotive have on the cost of operation?

Recommended practices for the employment and training of new men for firemen.

The advantages of the use of superheaters, brick arches and other modern appliances on large engines, especially those of the Mallet type.

How can the road foreman of engines improve the handling of the air brakes on our modern trains?

The electro-pneumatic brake.

The effect of properly designed valve gear on locomotive fuel economy and operation.

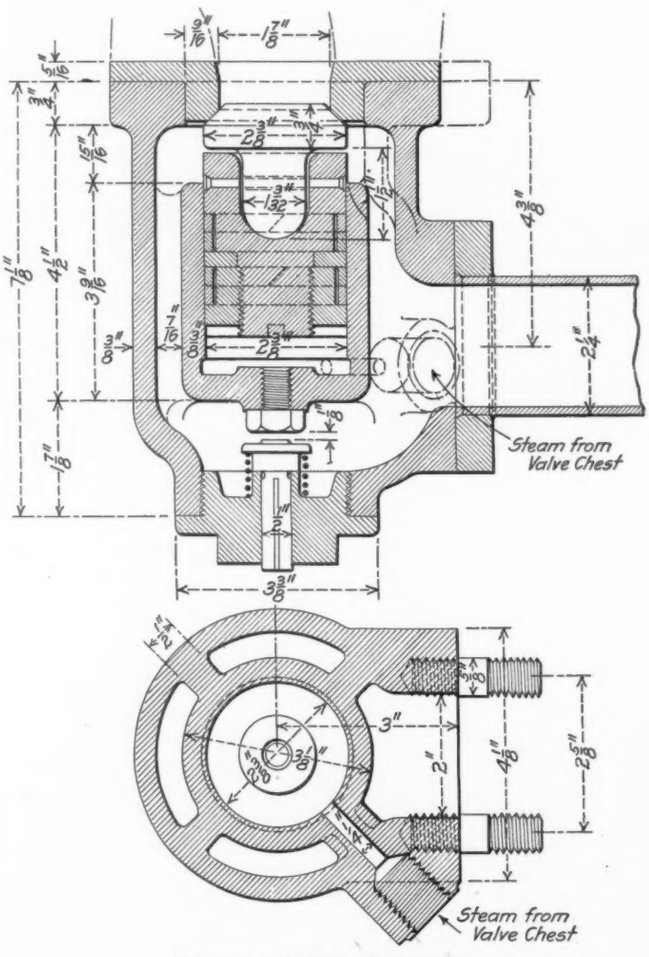
Scientific trainloading; tonnage rating.

The constitution and by-laws of the association were amended to include a fourth and fifth vice-president. The following officers were elected for the ensuing year: President, J. C. Petty (N. C. & St. L.); first vice-president, J. R. Scott (St. L. & S. F.); second vice-president, B. J. Feeny (Ill. Cent.); third vice-president, H. F. Henson (N. & W.); fourth vice-president, W. L. Robinson (B. & O.); fifth vice-president, G. A. Kell (G. T.); treasurer, D. Meadows (Mich. Cent.); secretary, W. O. Thompson (N. Y. C. & H. R.). Mr. Thompson was paid special tribute by being elected to the office of secretary for life. He is one of the three living charter members of the association.

At the close of the convention the secretary reported a total membership of 1,137, of which very nearly 50 per cent were registered at this convention. Chicago received the greatest number of votes for the next place of meeting.

SOME ENGLISH LOCOMOTIVE APPLIANCES

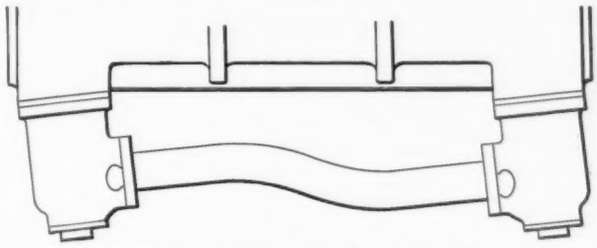
On some new 2-6-0 type passenger locomotives recently designed and built by the London, Brighton & South Coast, have been fitted three interesting appliances that are illustrated herewith. These locomotives were designed under the dirction of L. B. Billinton, superintendent of motive power.



Vacuum and Water Relief Valve

A feed water heating arrangement is provided on the tender and the boiler is fed by means of a Weir feed pump placed on the left running board. This heater consists simply of a steam injector arranged on the end of the tender tank with a connection to the exhaust passage in the cylinders.

It will be seen that it is fitted with a non-return valve so that the water cannot run back through the steam pipe. In addi-



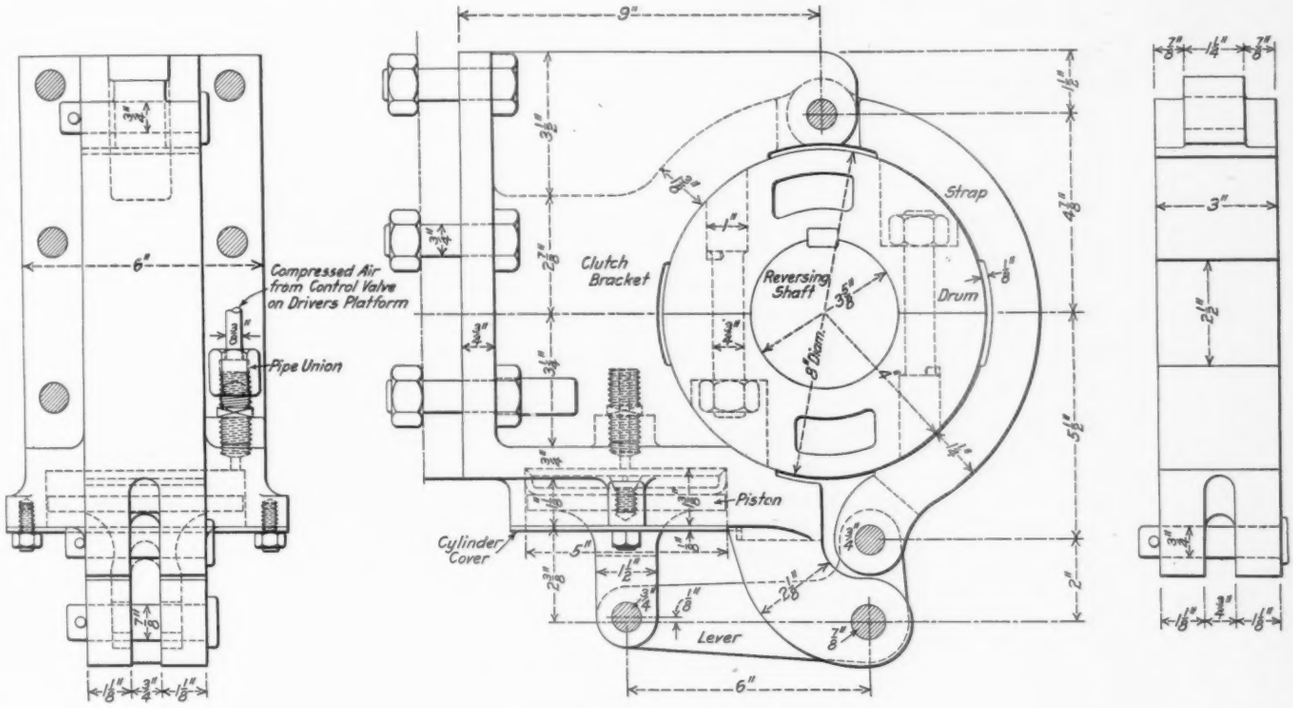
Application of Vacuum and Water Relief Valve

tion to the connection to the exhaust steam passage, provision is also made for carrying any superfluous steam generated in the boiler, to the water in the tender, instead of allowing it to blow off at the safety valves.

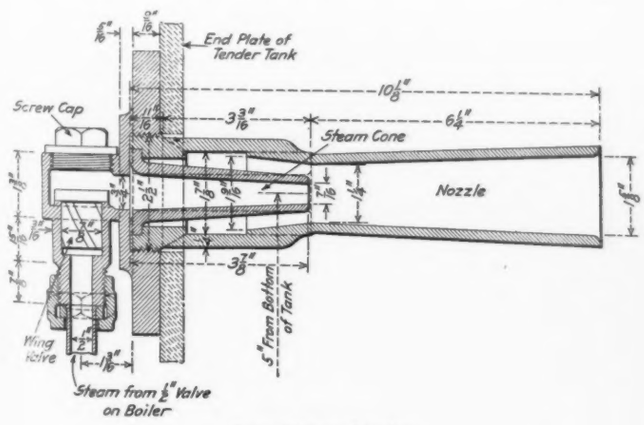
While the feed pump handles the boiler feeding normally, a combination (hot water type) injector is also fitted to the back head of the boiler to act as an auxiliary. A float feed arrangement is provided so that the hottest feed water, which, of course, will be near the upper surface in the tank, is drawn by the pump.

Another device fitted to this locomotive is an air operated clutch on the lift shaft of the valve gear. The valve gear is of the Stevenson type with a screw reverse mechanism and this clutch is fitted to the shaft for the purpose of steadying the motion and relieving the reach rod. The reversing screw bracket combines, with the screw, an air cylinder and piston for the purpose of assisting the operation when lifting the link and the air control valve for the clutch is interlocked and connected with this cylinder. The clutch also has an arrangement for control independent of the reverse.

The cylinders of these locomotives are fitted with a new type of combined vacuum and water relief valve, which is also shown in one of the illustrations. One of these valves is placed at the bottom of each end of the cylinder barrel. The construction and operation of the apparatus will be clear from an inspection of the illustration.



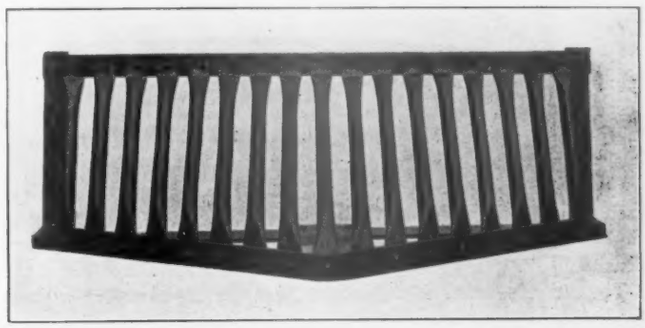
Clutch for Reversing Shaft



Feed Water Heater

METAL PILOT ON THE LEHIGH VALLEY

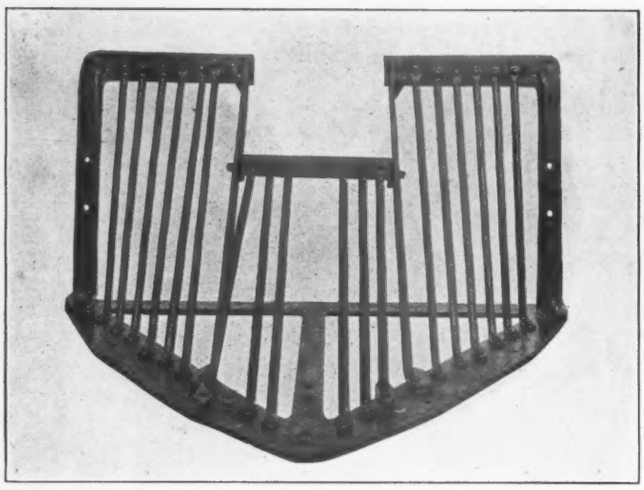
A short pilot has been developed on the Lehigh Valley which is neat in appearance and very simple in construction. It has a metal frame built up of flat bars and angles, with slats made of



Simple Short Pilot Now Used on the Lehigh Valley

scrap flues two inches in diameter. The construction is shown in one of the illustrations. It has been in use for some time with highly satisfactory results.

The all-metal long pilot, which was formerly used by the



Long Nosed Pilot Formerly Used on the Lehigh Valley

Lehigh Valley, is also shown in one of the illustrations. This pilot weighed 586 lb. and cost $27.58. The short pilot weighs 262 lb. and can be built at a cost of $5.47.

RINGLEMAN SMOKE CHART

The following notes concerning the construction of the Ringleman smoke chart and the methods of taking smoke readings are from Appendix III of Bulletin No. 8, entitled "Some Engineering Phases of Pittsburgh's Smoke Problem," issued by the University of Pittsburgh.

A rule by which the cards may be produced is given by Prof. Ringleman as follows:

Card 0. All white.
Card 1. Black lines 1 mm. thick, 10 mm. apart, leaving spaces 9.0 mm. square.
Card 2. Lines 2.3 mm. thick, spaces 9.0 mm. square.
Card 3. Lines 3.7 mm. thick, spaces 6.3 mm. square.
Card 4. Lines 5.5 mm. thick, spaces 4.5 mm. square.
Card 5. All black.

These lines and spaces are so arranged that the black covers respectively 0, 20, 40, 60, 80 and 100 per cent of the white surface of the card. These percentages are graded for convenience as smoke numbers 0, 1, 2, 3, 4 and 5, so that number 0 signifies no smoke or a clean stack; and number 4 signifies a stack which is emitting an 80 per cent black smoke, or for convenience the percentage of black smoke can be obtained by multiplying the smoke number by 20 per cent.

In making observations of the smoke proceeding from a chimney, the six cards are placed in a horizontal row and hung at a point 50 ft. from the observer, and as nearly as possible in line with the chimney. At this distance the lines become invisible, and the cards appear to be of different grades of gray, ranging from very light gray to almost black. The observer glances from the smoke coming from the chimney to the cards which are numbered from 0 to 5; determines which card most nearly corresponds to the color of the smoke, and makes a record accordingly, noting the time. Observations should be made continuously during, say, one minute, and the estimated average density for that minute recorded, and so on, records being made once each minute. The average of all the records made during the period of observation is taken as the average figure for the smoke density.

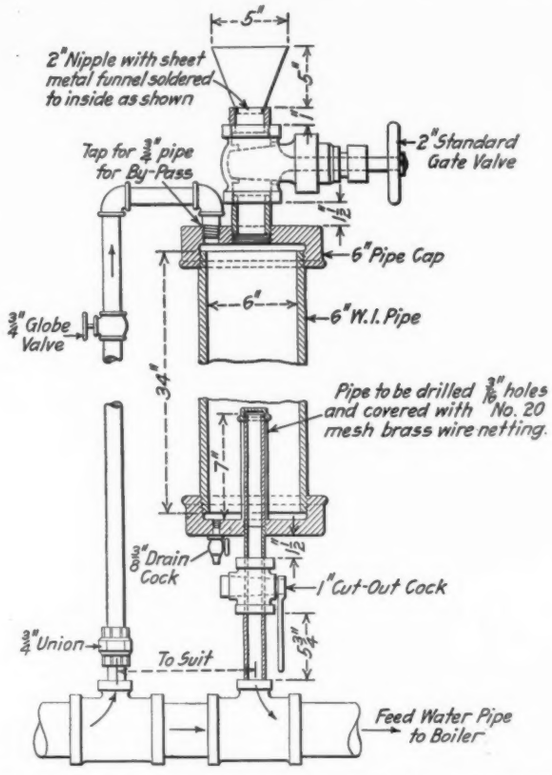
To determine the per cent of black smoke, or average density, the following rule was followed: Percentage of density equals smoke units × 0.20 divided by stack minutes.

DEVICE FOR FEEDING BOILER COMPOUND

BY F. W. DUNNING

The illustration shows a simple device for introducing soda ash, barium hydrate, or other compounds, into stationary boilers, which is used at the power house of the Wheeling & Lake Erie at Brewster, Ohio. It is well known that the introduction of some compounds, such as soda ash, into the feed water is liable to cause a deposit to accumulate on valve seats and other parts of the pipe line leading to the boilers. This device may be located between the feed pump and the boiler, thus causing the treating solution to affect a minimum length of pipe.

Before charging the container, the soda ash or other compound should be dissolved in a pail of hot water. The 1 in. cut-out cock and the ¾ in. globe valve are then closed and the 2 in. gate valve and ⅜ in. drain cock are opened, the latter draining the container of water. The ⅜ in. drain cock is then closed and



Device for Introducing Soda Ash Into Feed Water of Stationary Boilers

the container is filled with solution through the sheet metal funnel; the device is put in operation by closing the 2 in. gate valve and opening the ¾ in. globe valve and the 1 in. cut-out cock. The solution gradually flows through the cut-out cock into the feed water pipe and thence to the boiler. The rate of flow is regulated by means of the ¾ in. globe valve.

This device has been used to feed soda ash into four 450 horsepower Babcock & Wilcox boilers for several years. No repairs have been necessary and the boilers have been quite free from scale.

Use of Electric Vehicles.—Dr. Charles P. Steinmetz, of the General Electric Company, is credited with the prediction that within ten years there will be in operation not fewer than 1,000,000 moderate-priced electric vehicles whose approximate price will not exceed $500, with a speed certain to average 20 miles per hour.—*American Machinist.*

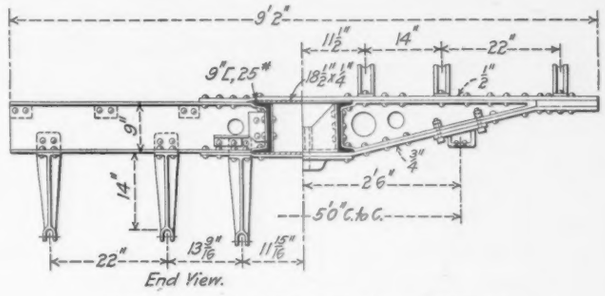
CAR DEPARTMENT

STEEL UNDERFRAMES FOR USE ON WOODEN FREIGHT CARS

A type of steel underframe for application to wooden freight cars has been developed at the East Buffalo car shops of the New York Central & Hudson River and is being extensively applied to wooden cars on the New York Central Lines. It has proved economical in application and the cars equipped with it are giving good results in service. The design is varied to suit the different types of cars, the two shown in the engravings being for box cars and gondola cars.

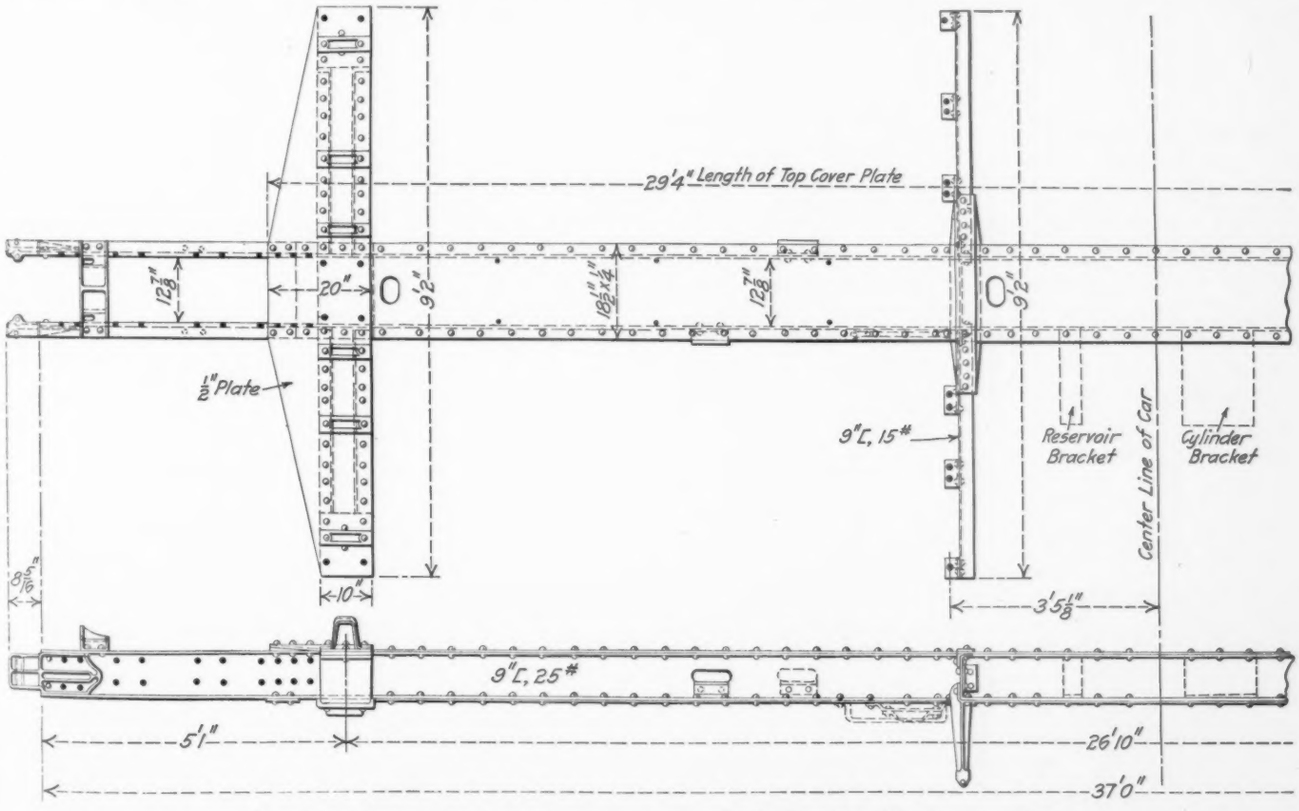
While the structure might not be termed by some a complete underframe it is sufficient to place the wooden cars to which it is applied in the steel underframe class. The old wooden sills are all retained, as are the truss rods, a reference to the illustration showing the queen posts and truss rod supports. The body bolsters used on the wooden underframe, are, however, entirely removed. As will be seen by reference to the frame used on box cars, this consists of two center sills with top and bottom cover plates, two body bolsters and two needle beams. The center sills are 9 in., 25 lb. channels and extend the full length of the car, there being a casting connecting them against which the wooden end sill seats. The center sills are placed back to back and spaced 12⅞ in. apart. The top cover plate is 18½ in. by ¼ in. and is 29 ft. 4 in. long, extending under the bolster cover plate and ending at the outer edge of the latter. The bottom cover plate is also 18½ in. by ¼ in. but is only 25 ft. 11¼ in. long, ending just back of the body bolster.

The body bolster has a top cover plate extending the full width of the car and passing over the center sill top cover plate. This is a ½ in. plate, 20 in. wide for a distance of 18½ in. or the width of the center sill cover plate, and tapering to 10 in. at both ends. Filler castings are used between the center sills and also from the center sill to the outer edge of the car while there is a 10 in. by ¾ in. bolster tie plate at the bottom extending across the



Cross Sections of the Box Car Underframe

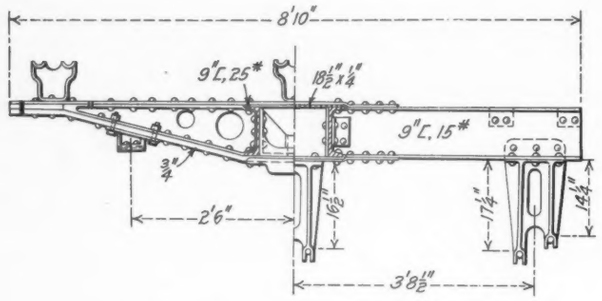
car; the center bearing is riveted to this tie plate. Each of the needle beams consists of two 9 in., 15 lb. channels connected to the center sill and extending to the outside of the car. A needle beam tie strap passing above the top center sill cover plate and riveted to the center sills and the needle beam channels connects



New York Central Steel Underframe for Application in Repairing Wooden Box Cars

The details of the underframe for use on gondola cars are sim-

ilar to those of the box car underframe. The center sills are 9 in., 25 lb. channels extending the full length of the car and spaced 12⅞ in. back to back. The top cover plate is 18½ in. by ¼ in., and is 28 ft. 4 in. long, extending between the outer edges of the bolster cover plate and passing under the latter.



Cross Sections of the Gondola Car Underframe

The bottom cover plate is 18½ in. by ¼ in. by 24 ft. 11¾ in., ending just back of the body bolster. The needle beams are 9 in., 15 lb. channels with a center sill filler plate and connecting tie straps top and bottom.

In the gondola cars there are used four corner braces consisting of 5 in., 9 lb. channels, 4 ft. 7 13/16 in. long. These connect to the top cover plate of the bolster and to a casting at the junction of the end and side sills of the wooden underframe. As in the case of the box car underframe, the end sill bears against the castings which connect the center sills near the end. On the gondolas the distance between truck centers is 25 ft. 10 in., while on the box cars it is 26 ft. 10 in. The box car center sills are 37 ft. over all and those on the gondola cars are 36 ft. over all.

SAVING CAR DAYS

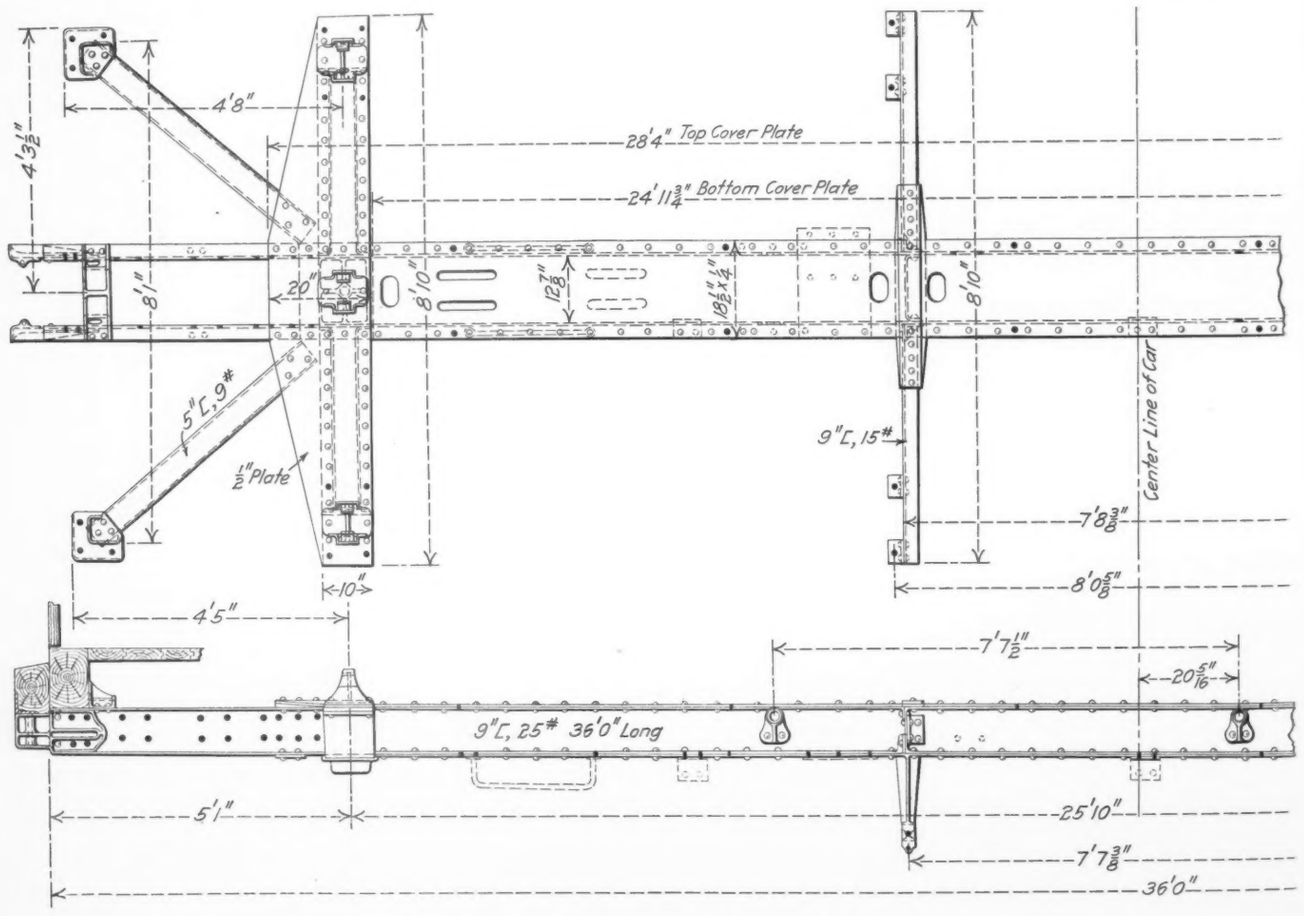
O. C. Castle, car service agent of the Sunset-Central Lines, has issued a bulletin on the subject of "Saving Car Days," giving figures to show that during the fiscal year 1914 the system made a saving in car hire balance of $430,865, a daily average saving of $1,180, or the equivalent of 2,622 car days. The average mileage per car per day for all cars on the line increased from 20.4 in 1912-13, to 21.9 in 1913-14, while the movement of foreign cars increased from 21.4 to 28.6 miles per car per day. The bulletin states that these results were accomplished by eternal vigilance and persistent "plugging" on the part of hundreds of loyal employees in the campaign to save car days; and it urges all the employees and the officers to continue their efforts in this direction. The bulletin concludes with the following:

"From the present unsettled outlook, due to the European war, the company is going to need every 'car day' we can put away in our savings banks.

"Let's watch the little car days, and make the slogan 'Save the Car Days' next in importance to 'Safety First.'

"I'll be glad to get a note from any one any time, telling how you have saved a 'car day.' Am sure the assistant general manager will take time to look at such notes as I may pass along to him; and the president, too—he is never too busy to hear about a piece of good work in the line of car movement.

"After all, when you come to think of it, that's what we are all here for—to move cars; and if we move the cars the 'days' will take care of themselves."



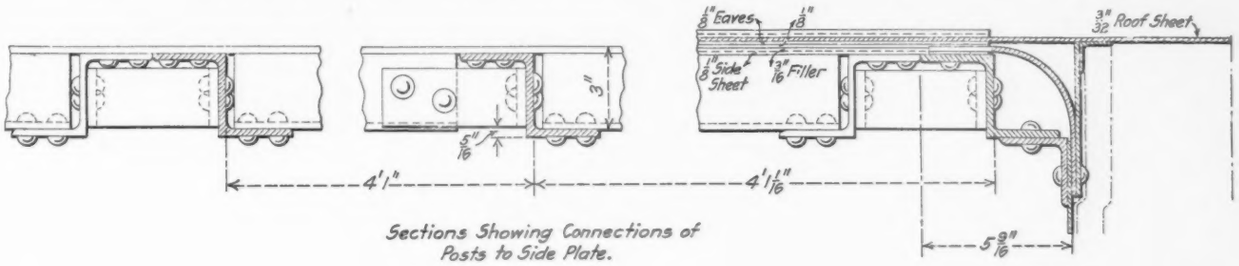
Steel Underframe for Application to Wooden Gondola Cars

LONG ISLAND STEEL BAGGAGE CAR

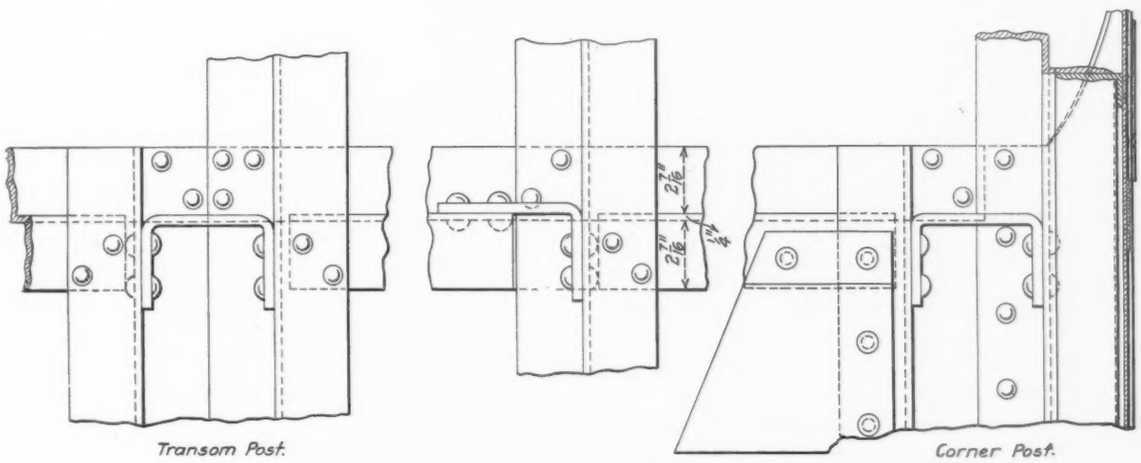
A 40 Ft. Car of Exceptionally Light Weight, Having Arch Bar Trucks With Swing Bolsters

In order to meet the requirements of service conditions existing on its lines the Long Island has recently placed in service 20 steel baggage cars 40 ft. in length and weighing 50,600 lb., built by the American Car & Foundry Company.

Over some of its lines the Long Island handles a heavy baggage and express business, in many cases the consignments to two or three stations completely filling a long baggage car. The consignments for such stations can be loaded into one of the short cars and the car set out, while with long cars it would be necessary to hold the train at the station while the unloading was being done. A large part of this traffic moves during the summer months only, and advantage of this fact has been taken to build a car of exceptionally light weight at a low first cost. During the winter months when these cars are but little used the amount of investment tied up in idle equipment is thus kept to a minimum.



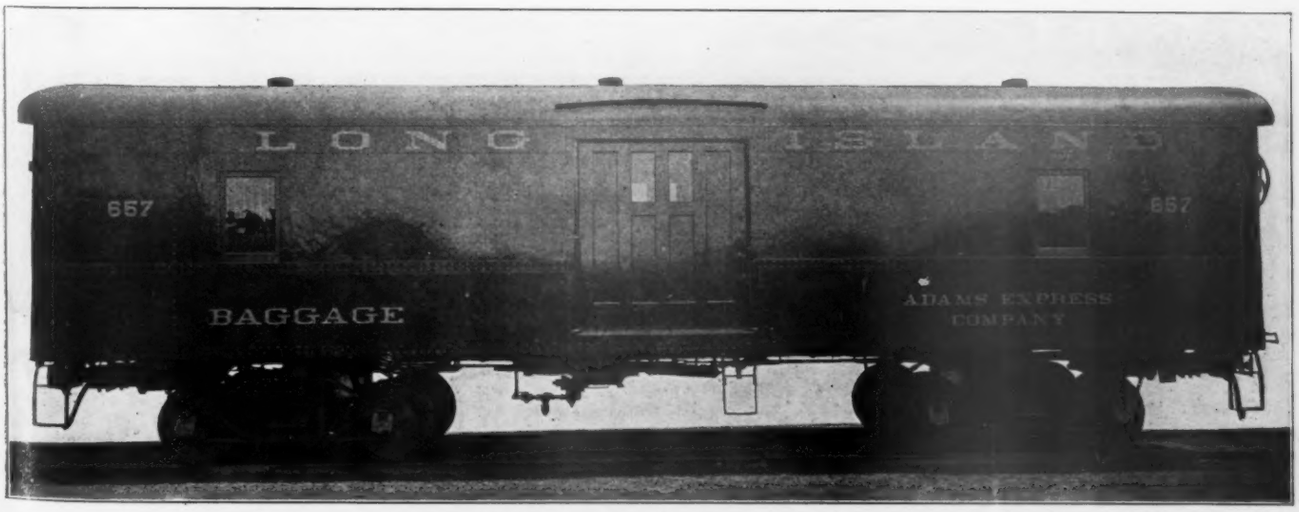
Sections Showing Connections of Posts to Side Plate.



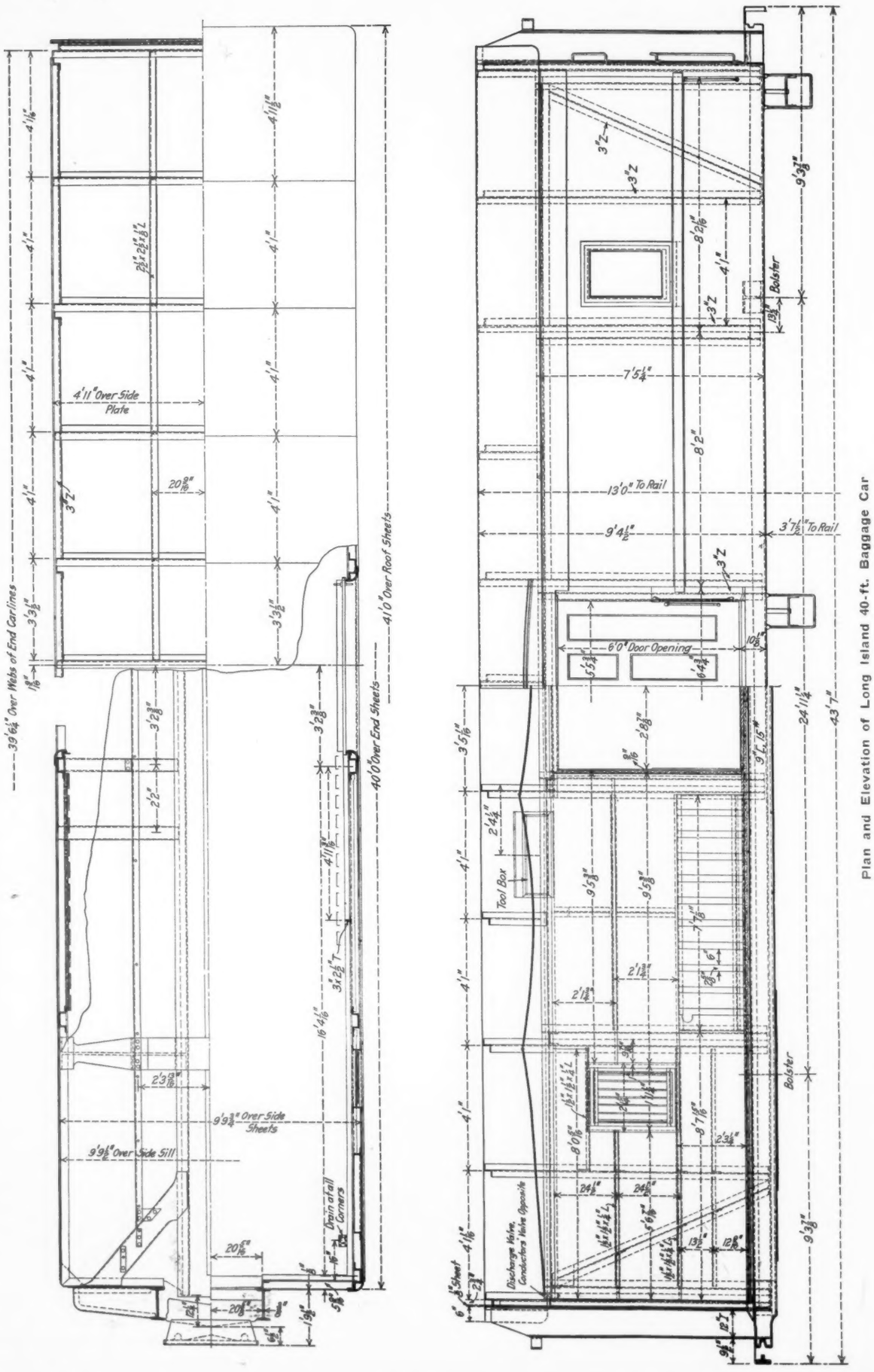
Sections Through Side Posts, Showing Connections to Side Plate

UNDERFRAMES

The center sills are 9 in. channels extending continuously between the end sills. Continuous cover plates both top and bottom are provided, the top plates being ¼ in. thick and the bottom ⅜ in. thick. The sills are further reinforced at the bolsters by additional ⅜ in. bottom plates, each 6 ft. 5 in. long.



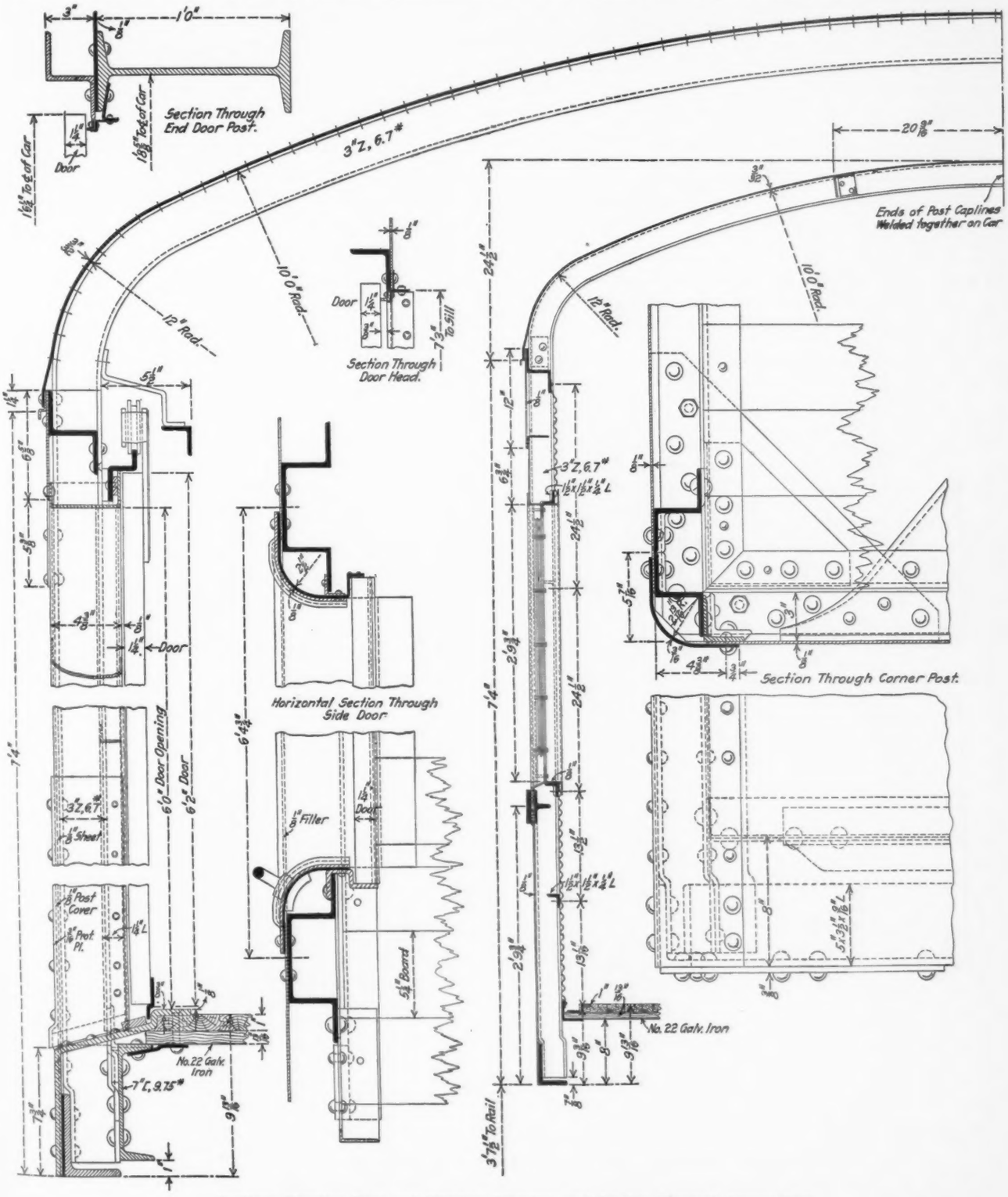
A 40-ft. Baggage Car for the Long Island



Plan and Elevation of Long Island 40-ft. Baggage Car

Between the bolsters the side of the car acts as a girder to support a portion of the load which is transferred to the truck center by the cast steel body bolsters.

The side sills are 5 in. by 3½ in. by 7/16 in. angles secured at the corners to end sills of the same section by means of gusset plates, and riveted to the ends of the body bolsters. Four lateral stiffeners of 5 in. channel section are included on each side. Two of these are located under the door posts and two at points about 26 in. from the door posts. They extend from the top flanges of the center sills to the lower flanges of the side sills and are placed with the flanges downward. The side sills are stiffened under the side doorway by 7 in. channels riveted to the Z-bar posts.



Sections Showing Door and Window Framing, and Section Through Corner Post

The frame of this car is designed to be equivalent in strength to the requirements of the railway mail service. In order to meet these requirements two 12 in. I-beam end posts have been included in the construction of the end frame. These are framed into a steel bumper casting at their lower

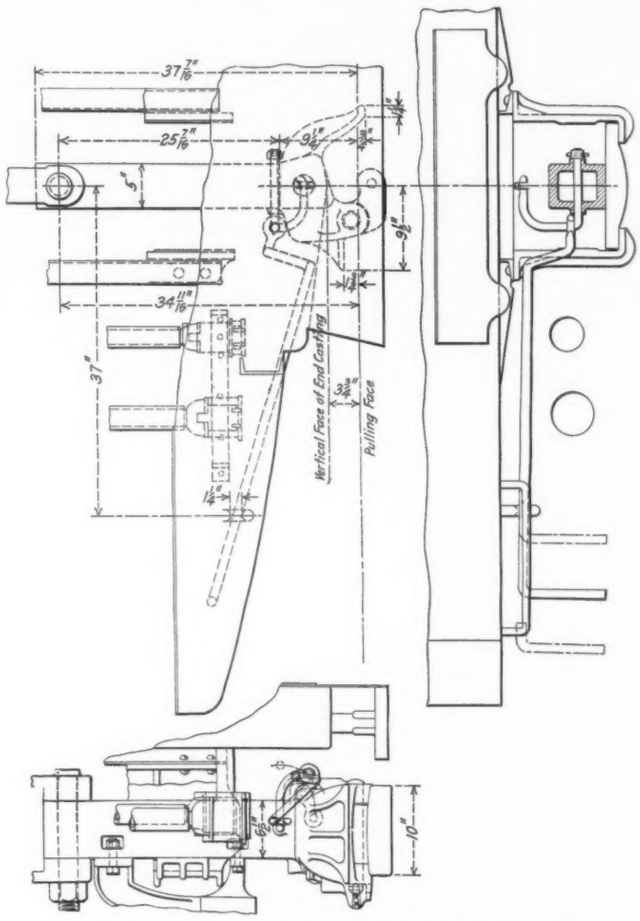
ends and are secured to the carlines at their upper ends. They are located at points 20⅝ in. on either side of the center line. The center sills are also attached to the steel bumper castings, thus securely tying the end frame to the underframe and making a very rigid construction.

Extending from the corner of the car to the end post on either side are 5 in. by 3½ in. by 7/16 in. angle sills, to which the end sheathing is secured. Platforms are located on the ends of the car at diagonally opposite corners, from which the hand brake wheels are operated.

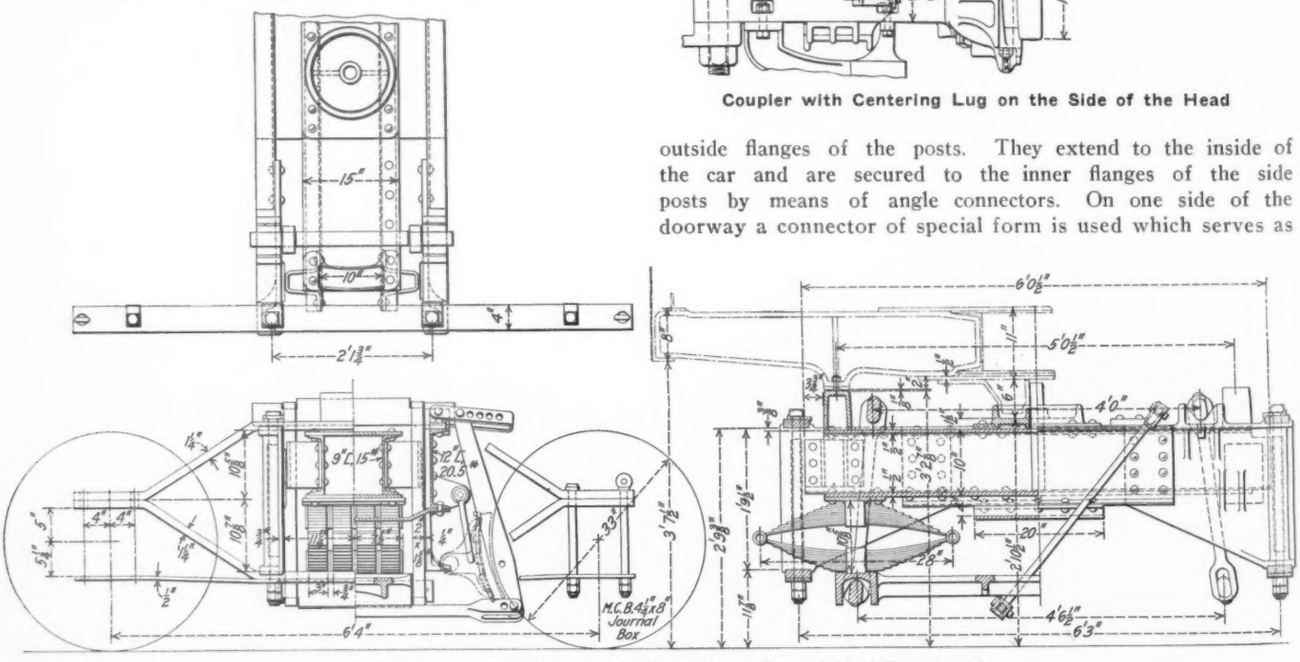
SUPERSTRUCTURE

The body frame members are 3 in. Z-bars. The roof is U-shaped without clerestory. The carlines are extensions of the corner and side posts, being formed in two parts and welded at the center of the roof when placed on the car. A Z-bar plate extends continuously from corner post to corner post except where the web and one flange is cut away to allow the continuous side posts to pass through. The method of securing the posts to the plate is shown in one of the engravings. The corner, transom and door posts are made up of two Z-bars, one of which extends from the side sill to the plate only. The outside sheathing is ⅛ in. steel plate, four pieces being required for each side of the car. These pieces extend continuously from the end to the side door casing and are joined horizontally by a cover plate at the belt rail, which is located just under the window. Longitudinal stiffness is secured by means of a T-bar riveted behind the belt rail. The inside of the car is lined with corrugated sheet steel, the corrugations running lengthwise. Considerable longitudinal stiffness is secured in this manner and no vertical stiffeners are required between the posts. The outside and inside window casings are each flanged in one piece from ⅛ in. plate to form a Z-section. The outer flange of the outside section is riveted to the side sheet and the inner flanges of the two sections are placed back to back. The window is held in place in the outside casing by means of bolts passing through both inner flanges. The inner casing is secured to outside flanges of the posts. They extend to the inside of the car and are secured to the inner flanges of the side posts by means of angle connectors. On one side of the doorway a connector of special form is used which serves as a 1½ in. by 1½ in. by ¼ in. angle both at the top and bottom; these angles extend between the two adjacent side posts, with the backs of the vertical flanges flush with the inside flanges of the side posts. Similar stiffeners are placed longitudinally at points 24½ in. and 49 in. below the side plate, at which points the corrugated lining sheets are connected.

Horizontal and vertical sections through the side door frames are shown in one of the engravings. Post covers formed from ⅛ in. plate extend from the outside of the car where they overlap the side sheets and are riveted to the a door stop. On the other side the post cover is bent around parallel to the side wall of the car, where its edge forms a seat for the weather strip on the back side of the door. The door is supported by rollers, the track for which is a special Z-section flanged from ¼ in. plate. This is riveted to the



Coupler with Centering Lug on the Side of the Head



Arch Bar Truck with Swing Bolster, Used Under Long Island Baggage Car

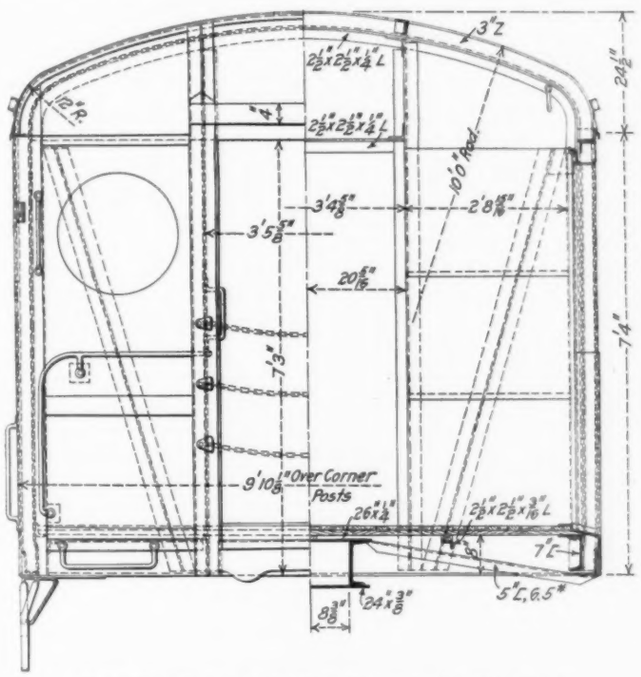
flanges of the side posts. In order that the top casing may extend inside the car flush with the side post cover, ⅜ in. filler blocks are included on either side of the door track.

The floor is made up of two thicknesses of wood flooring, the under side of which is protected by one thickness of No. 22 galvanized iron. The ends of the first course of flooring are supported by angles which are riveted to the inner flanges of the side posts. A wood nailing strip secured to the top cover plate of the center sills on the center line of the car supports the floor at this point. Intermediate nailing strips located about 28 in. on either side of the center line are supported by 2½ in. by 2½ in. by 3/16 in. angles secured to the diagonal end braces and to the top flanges of the cast steel bolsters.

The roof is covered with 3/32 in. steel plate. Longitudinal roof supports of 2½ in. by 2½ in. by ⅛ in. angle section are placed between the carlines at points about 20 in. on either side of the center line; these serve to stiffen the roof sheets, but the sheets are riveted only to the carlines.

TRUCK

The truck applied to these cars is of a design unusual for passenger equipment. It is of the unequalized arch bar type



End Elevation and Section Through the Side Door

having a wheel base of 6 ft. 4 in., but has been modified to include a swing bolster. The cross frame is made up of two 12 in., 20½ lb. channels securely riveted to the truck columns. A cast steel spring plank is suspended from the frame by means of swinging hangers, from which the truck bolster is supported on elliptical springs. The wheels are cast iron, 33 in. in diameter and are mounted on standard M. C. B. 4¼ in. by 8 in. axles. Standard 4¼ in. by 8 in. freight car journal boxes are used.

OTHER DETAILS

The cars are equipped with special Sharon couplers designed to be self-centering. The drawbar is of the usual long shank type used in passenger service. A special lug is cast on the coupler body which acts as a stop to the guard arm of the engaging coupler and thus limits the angle between the center lines of the two drawbars.

These cars are the result of a careful study of operating and traffic conditions. Full advantage has been taken of the requirements of the service to build a car which has a capacity of 50,000 lb. and weighs but little more than 50,000 lb., and one which meets the imposed conditions much better than would a heavier car of more expensive construction.

CAR DEPARTMENT CORRESPONDENCE*

BY FRANK CLEARY,
Chief Clerk, Car Department, Delaware, Lackawanna & Western, Buffalo, N. Y.

Reviewing car department work in recent years, we become impressed with the constant increase in correspondence and as we study the conditions we are led to believe that with due care and observance of instructions, some of it at least could be noticeably reduced and a more satisfactory condition brought about. The object of this paper is to show some of the conditions that make for unnecessary correspondence and to make a few suggestions that to the mind of the writer would have a tendency to bring about the desired result.

Time expended in correspondence should be used as judiciously and effectively as on any of the other features of car work, and if it is possible to clear the situation with one letter, do not permit oversights or errors to be the cause for writing two. We pride ourselves on our frugality in the use of lubricants and material of all kinds and why not now, of our own initiative, show our ability to cope with the needless correspondence situation?

We are all aware that errors are accountable for much unnecessary correspondence, and which of us is not aware of the annoyance invited by furnishing a wrong transfer or adjustment order, a wrong number or initial in connection with M. C. B. foreign repair bills, or looseness in a report giving an account of a train accident? Allow me to cite an example of the latter.

A trainman makes a report of an accident to his train, involving derailment and damage, and assigns as a reason that a brake beam dropped on one of the cars moving in his train. This report is accepted by his superiors as sufficient information as to the cause. A car department man is instructed to make a report on this accident. He shows the numbers and initials of the cars and parts of each damaged and assigns as the reason for the accident that a brake beam dropped; this report is incomplete and unsatisfactory. He has failed in his mission—has caused delay to the report to the officers and has caused the writing of several unnecessary letters.

In order that his report may be acceptable from a car department standpoint, it must show the cause of the brake beam dropping. This may be a broken brake head, brake hanger, poor track conditions or the absence of cotter keys, allowing the displacement of bolts. It must show also whether the originating or initial defect was entirely new, occurring in movement, or partly old, and whether the defect could or could not have been detected by the inspectors through whose jurisdiction the car passed.

In like manner a trainman reports an accident and assigns a broken wheel as the cause. The car department man, to meet the requirements, goes into detail showing the cause of the wheel breakage, such as a prolonged application of the brake, a worn flange or a seamed tread. He also shows the name of the manufacturer and the date and arranges for proper inspection of the triple and retainer under certain conditions. Should he fail in any particular, he contributes the usual amount of unnecessary letter writing. Reports of this character should be made with the least possible delay and by all means before letters of inquiry from officers are necessary.

This and all correspondence possible should be handled without the necessity of inquiries, and strange to say we are

*From a paper presented at the meeting of the Niagara Frontier Car Men's Association, Buffalo, N. Y., August 17, 1914.

generally able to make reply to an inquiry on the day we receive it, whereas the original should have received this attention.

It may appear from this that more is expected of the car department man than from the trainman. This is not so. The nature of the work in the department that he is engaged in demands that the special information mentioned be furnished.

A wider field of error and one that furnishes its full quota of unnecessary foreign correspondence and tracing is the work of rendering foreign car repair bills; and we need consider but one feature of this to account for numerous letters and corrections, namely, "Wrong Numbers and Initials."

We will assume that we have several reports of repairs returned to us as it seems that the car record office could not locate any movements of the cars on the line about the dates that reports show repairs to have been made. We ascertain that corrections must be made which generally run about as follows:

We find that the initials reading N. Y. C. & St. L. should read N. C. & St. L.; N. Y. C. & H. R. should read N. Y. C. & St. L.; C. M. & St. P. should read C. M. & P. S.; C. R. I. & P. should read C. R. I. & G.; Can Pac. should read Central Pacific; and numerous others along this same line, occurring through a similarity in the initials, but the wrong recording is by no means justified and with ordinary care could be entirely avoided.

Add to this the wrong number feature, such as 7715 for 7751, and we have the situation complete with the exception of the trouble caused by equipment introduced of recent years bearing numbers of six figures which has a tendency to increase the wrong number taking.

Wrong initials prove the greater source of annoyance, as this means a correction in the amount of the bills made up, which is not occasioned by wrong numbers. Considering the errors in repair bills other than those occasioned by numbers and initials, we find that the Master Car Builders' code of rules, which form the basis of all such charges, have grown so rapidly that they require close scrutiny and precision in making proper charges of owners' defects. This requires ability and experience to recognize the outlines of what constitutes combination of defects denoting rough handling. Still, the foreign repair bills corrected for errors of this nature are comparatively few when compared with the corrections made for wrong numbers and initials, the latter work having remained as simple as it was at the inception of the rules and again evidence is furnished that carelessness is responsible for errors and subsequent loss of labor in making corrections. The great care to be exercised and study required in making foreign repair bills according to the present code and the ever increasing danger of errors, due to the many changes introduced from year to year, leads me to believe that a biennial change of the rules would be desirable, were it not that perhaps more weighty reasons demand the annual change to meet carrying requirements.

It may appear to some that the difficulties outlined have been overdrawn or that recourse was had to imagination to produce the conditions described. However, I believe on close observation that it is simply a fair representation of what is going on around us on all lines and I am satisfied that it has assumed its present proportions through lack of care on the part of employees taking numbers and initials from the cars and by men in supervisory positions not offering any criticism to the individual responsible at the time the corrections are made. By making corrections without the knowledge of the responsible party and allowing him to continue, the way is paved, not merely for a continuation of this annoyance, but for an increase, making the conditions chaotic.

It is such an easy matter with some little care and attention to perform the work of handling numbers and initials correctly that continual failure on the part of those engaged in doing it would be accounted for by the absence of supervisory attention on the part of men directly in charge of the work.

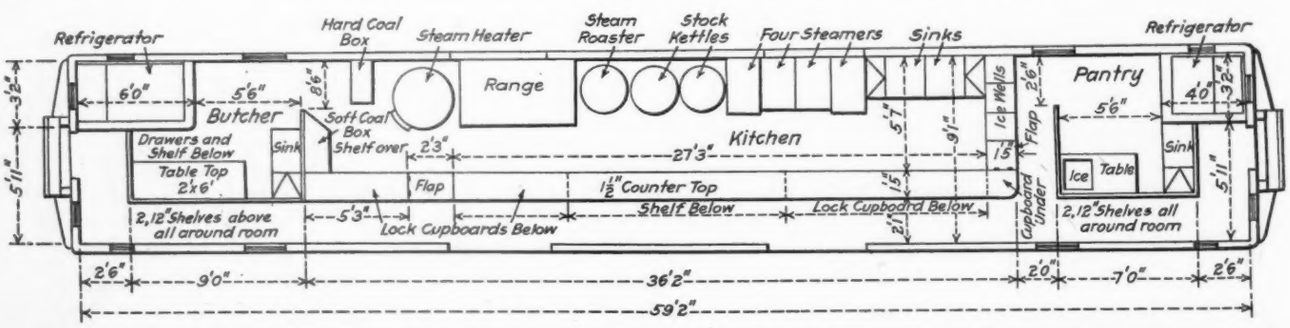
Of equal importance with the repair bill condition is the work of transfer and adjustment orders and defect cards as established under the Niagara Frontier Association rules and many indeed are the avenues of error in the performance of this work. A receiving line's inspector issues a delivering line's defect card and is informed in due time of tracing that it has been improperly issued and that it should have been issued against some other line. The inspector being questioned, explains it by showing an absence of symbol marks indicating the delivering line, and as symbol marking is part of the system of the Frontier inspection, no member of the association should be required to adopt extraordinary methods to arrive at proper deliveries, but by the co-operation of the delivering line should receive the needed information.

Let us have some consideration for the arbitrator and his office assistants who make the defect cards and transfer orders bona fide by their O. K. stamps, but who have not within reasonable reach, the records of the various lines to test the correctness of car numbers, initials or deliveries and are therefore depending solely on the forces of each individual line to make accurate reports and avoid complications.

The foregoing does not embody all the difficulties we have to contend with in car department correspondence, but represents some of the cardinal features that lead to useless labor and the elimination of them may lead to improvements generally. There is work for all in bringing about the desired result. Let us educate, co-operate with and encourage those about us who may be in need of our assistance to the end that as a department force, not as individuals, our service may become most effectual and satisfactory.

SPECIAL DINING CAR FOR TROOPS

For the purpose of serving meals in connection with the transportation of troops, the Canadian Pacific has recently put into service commissary kitchen cars, the plan of which was worked out in the sleeping and dining car department. A floor plan of



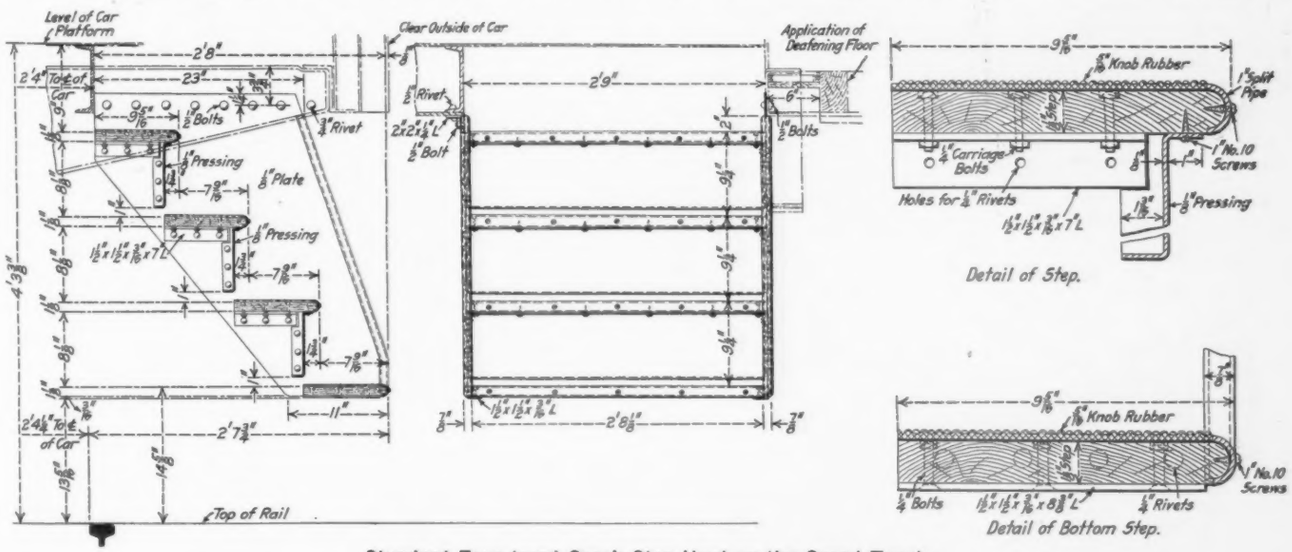
Floor Plan of Dining Car Used on the Canadian Pacific, and Arranged for Serving Meals to Troops while in Transit

the car is shown in the engraving. It will be seen that there is a refrigerator and butcher shop at one end and a combination pantry and pastry room at the opposite end with the kitchen in the middle. The equipment for the latter includes a coal range, a steam roaster, two soup kettles and four steam cookers. The steam utensils are operated by live steam generated in a vertical boiler with which each car is equipped. Each of these cars is capable of feeding 1,000 men three times a day. The floor is covered with heavy galvanized iron sheathing on which are placed heavy baggage racks made in small sections. There are three large water tanks under the car operated by air pressure, in addition to overhead tanks. The total water capacity is 1,490 Imperial gallons. Boxes for holding vegetables are placed under the car and the coal box is so arranged that it extends to the roof and is filled through a trap.

COACH STEP WITH FOUR TREADS

The four tread coach step shown in the accompanying drawing was developed on the Grand Trunk and is now the standard step for the passenger equipment of that road. The end pieces and risers are of ⅛ in. steel while the steps are of wood 1⅛ in. thick covered with 5/16 in. knob rubber treads. The steps are supported at the ends on 1½ in. by 1½ in. angles riveted to the end pieces, and all except the bottom step are further supported by the pressed steel risers. The steps are secured to the angle supports by ¼ in. carriage bolts, the heads of which are recessed and covered by the rubber treads, while 1 in. No. 10 screws are used to secure the steps to the risers. Each step has a rise of 9¼ in. and a clear tread 7 9/16 in. wide, with the bottom step normally 14⅝ in. above the top of the rail.

The standard step formerly used on the Grand Trunk was the same that is used on sleeping cars. This step had but three treads below the platform and stepping boxes were required for the use of passengers entering or leaving the coaches. The stepping box, however, was found to be dangerous on account of its small size and the distance passengers had to step to reach the top of the box. Passengers would often step on the edge of the box and turn it over, which very frequently resulted in severe injury. Since the adoption of the four tread step passengers are able very comfortably to enter or leave the coaches without the use of stepping boxes from platforms placed at track level.



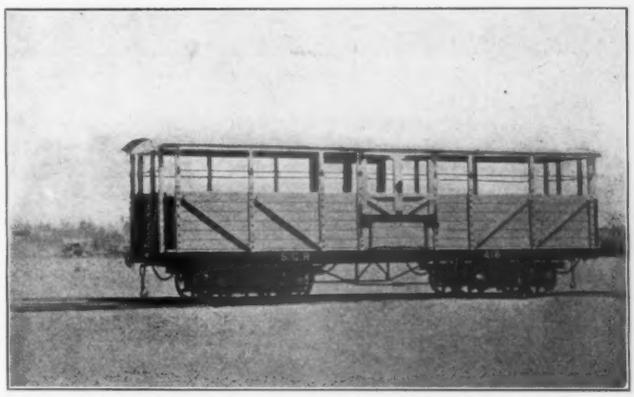
Standard Four-tread Coach Step Used on the Grand Trunk

USE OF LATHES.—The lathe today on much work should be a roughing tool and the grinder a refining tool.—*American Machinist.*

STEEL CONSTRUCTION IN FOREIGN CARS

The use of steel in rolling stock in Great Britain and some of the British possessions, while not carried to the extent that is becoming general in America, has some interesting applications. One of the noticeable features is the use of truss rods on side sills, a form of structure which has comparatively little application in America.

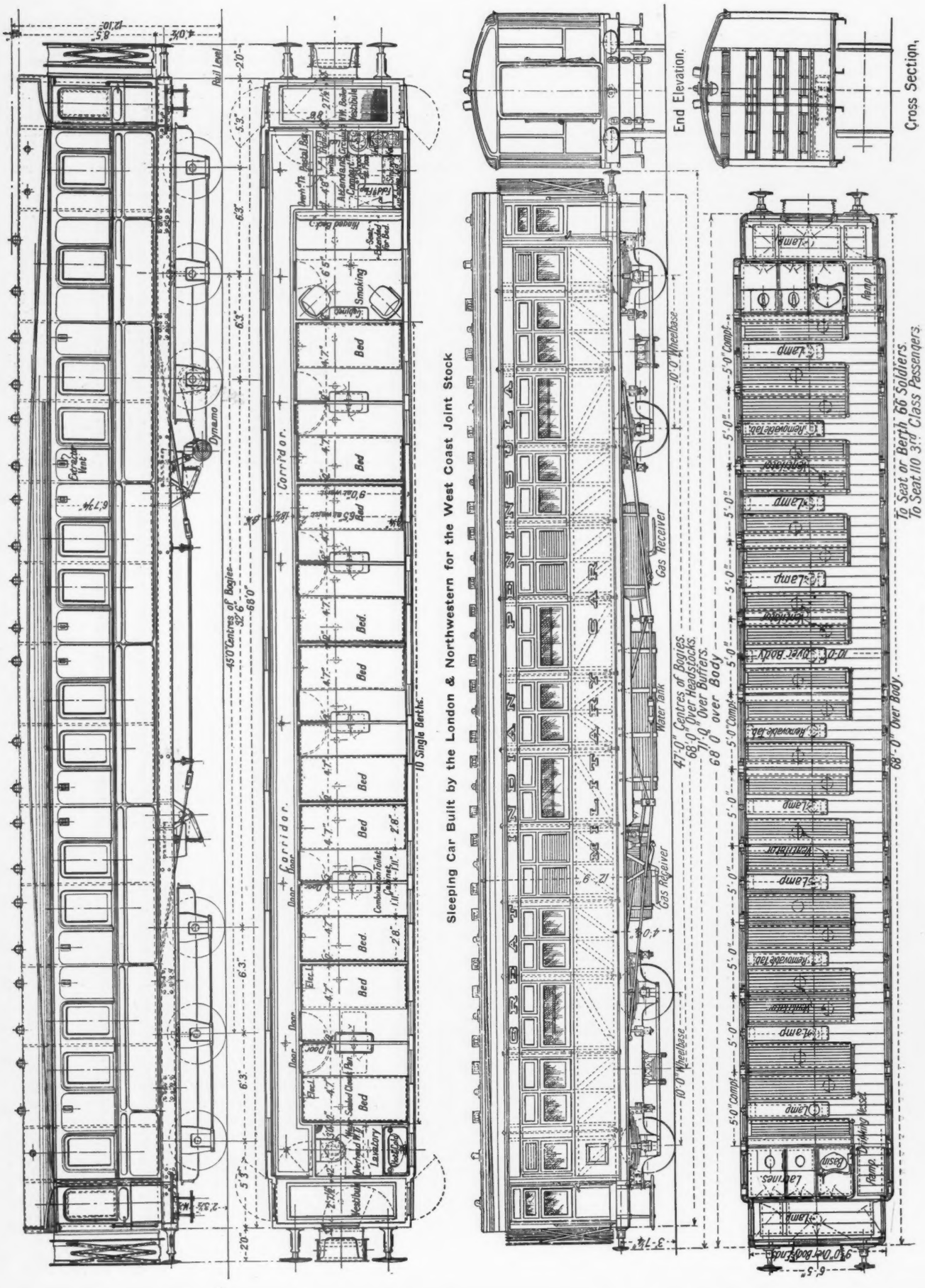
Among the illustrations are included several views of a car



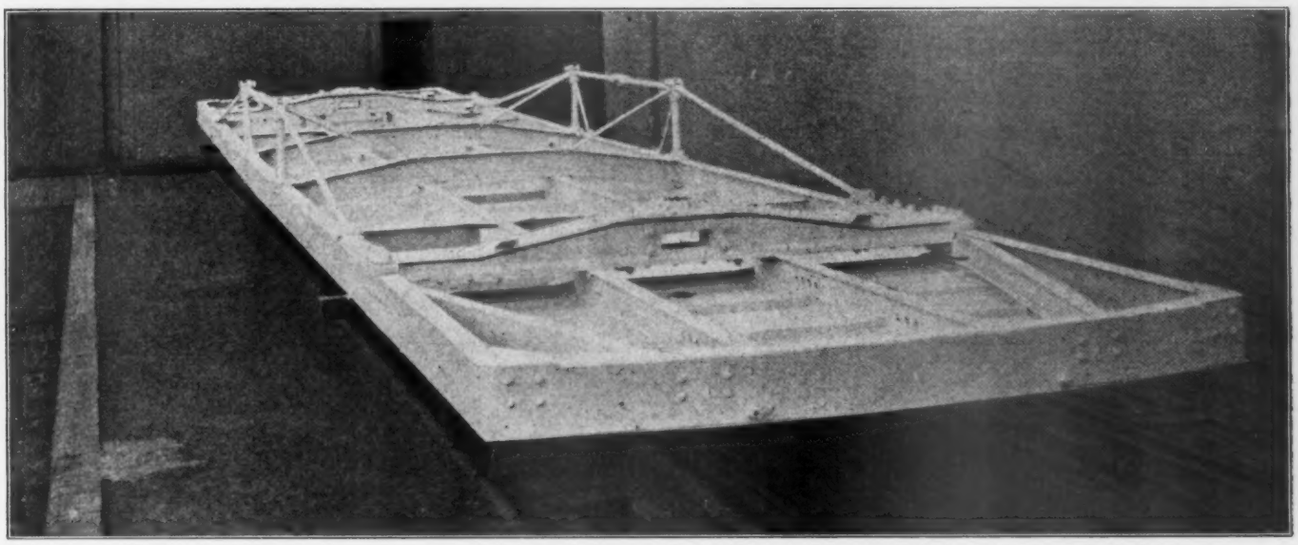
Sudan Government Railway Cattle Car

which is one of a number recently built for the Metropolitan District Railway, London. The body framing of this car resembles in some respects the cars in use in the New York subway. The underframe is the feature of particular interest, and it will be noted that there are but four sills employed and that the center sills or longitudinals are spaced considerably farther apart than is the general practice in America. The truss rods used in connection with the side sills or solebars are a noticeable feature, and it will be noted that the cross ties or crossbearers are so formed as to pass under the center sills while the body bolster is placed below all the sills. The interior panels of these cars are of steel in mahogany frames, with steel ornamental holdings at the cornices. The cars are 49 ft. long over the end sills and 8 ft. 8 in. wide over the framing while the trucks are spaced 34 ft. 1 in. between centers. They have a seating capacity of 48; the trailer cars weigh about 50,000 lb., and the motor cars about 76,000 lb.

The use of the truss rod in connection with the channel section side sill is again shown in the military cars of the Great Indian Peninsula Railway. The center sills of this car are

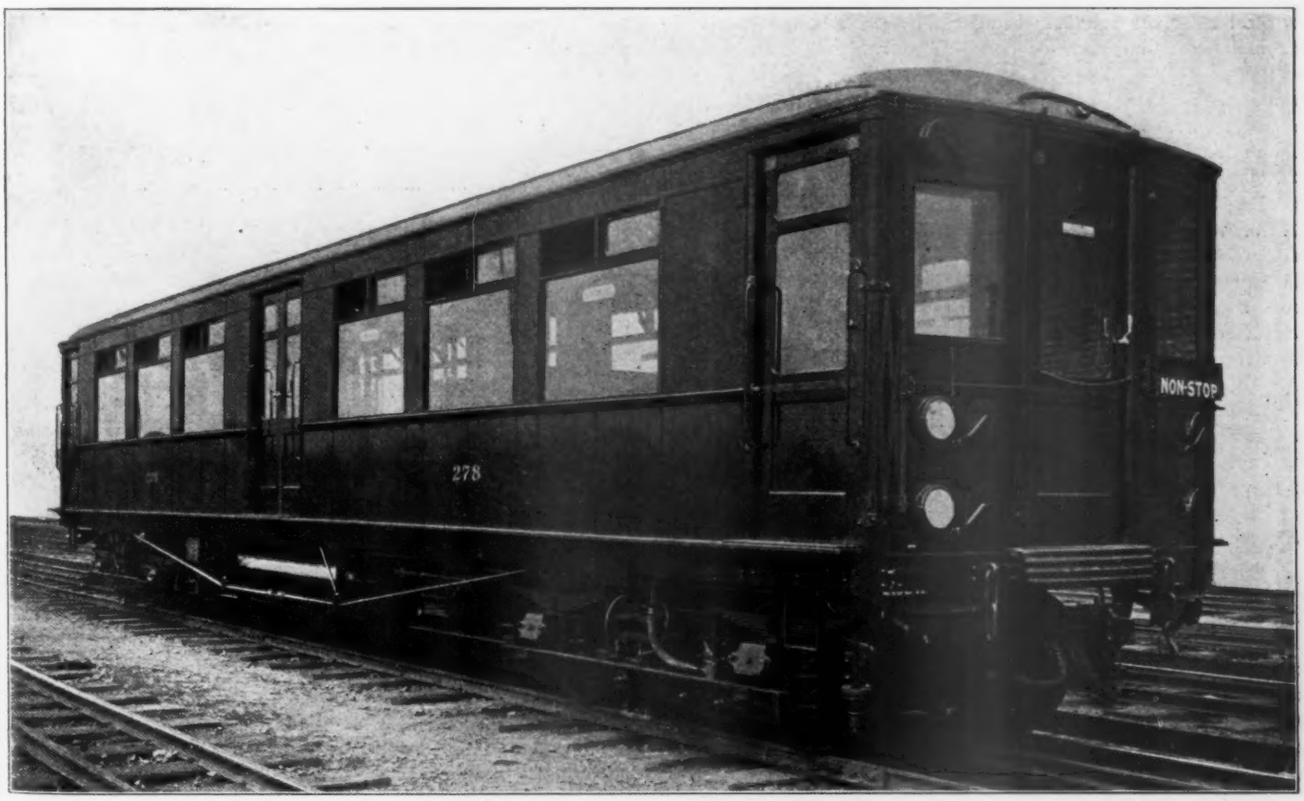

Sleeping Car Built by the London & Northwestern for the West Coast Joint Stock
GRAND INDIAN PENINSULA RAILWAY
End Elevation.
Cross Section,
Military Car for the Great Indian Peninsula Railway
Corridor.
Bed
Smoking
Lavatory
Dynamo
Gas Receiver
Water Tank
Lamp
Basin
Lockers
Drinking Vase
10 Single Berths.
To Seat or Berth 66 Soldiers.
To Seat 110 3rd Class Passengers.
68'0" over Body
68'-0" Over Body.
10'-0" Wheelbase
47'-0" Centres of Bogies.
68'-0" Over Headstocks.
71'-4" Over Buffers.

also of channel section and the car is 68 ft. long over end sills, with the trucks placed at 47 ft. centers. Some sleeping cars built by the London & North Western for the West Coast Joint Stock form still another example of the truss rod method of



Underframe of the Metropolitan District Car

construction. These cars are mounted on six-wheel trucks, and while not in use on these particular truck frames, it is of interest to note that the truss rod arrangement is employed for strengthening the side frames of steel trucks in some cases on



Steel Motor Car for the Metropolitan District Railway

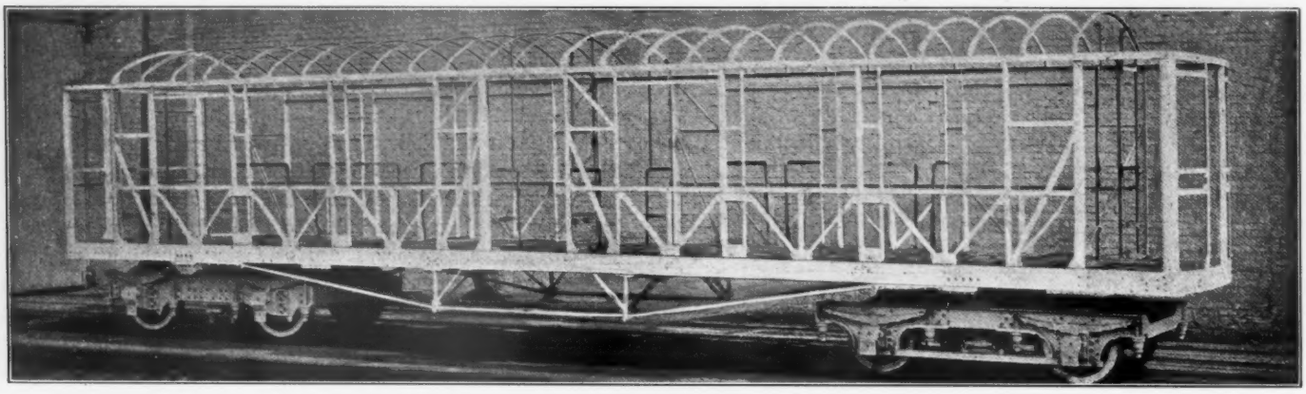
English railways. The West Coast sleeping cars are 72 ft. long over the buffers and 68 ft. long over the end sills with the trucks placed at 45 ft. centers.

In a number of sleeping and buffet cars built within the past few years for the Sudan Government Railway the side sills consist of 10 in. I-beams. At a distance of 2 ft. 10 in. from the end sill the side sills are bent toward the center of the car, making the end sill 7 ft. long, while at other points on the 60 ft. frame the width is 8 ft. 10 in. The center sills are 6 in. channels, and both the center and side sills are fitted with 1½ in. truss rods with queen posts spaced 14 ft. 5⅛ in. apart. There are three central cross members composed of 6 5/16 in. channels extending in one piece across the frame and passing under the center sills at points 15 ft. 6 in. from each end, while another cross member of the same section is cut by the center sill. The body bolsters are 10 in. channels and extend in one

piece across the frame, which is counterbraced with 3 in. by ⅜ in. flat iron.

Steel construction was also used in some of the older Sudan Government cars, in which the side sills were of channel section 7⅞ in. deep and the center sills of the same cross section. The frame is 45 ft. over the end sills and again the truss rod construction is employed, the side sills being trussed by tie rods 1¼ in. in diameter, the lower ends of the queen posts being braced by 2 in. by 1 in. by ⅜ in. angles to the center sills. In this underframe the cross members are 7⅞ in. channels and are cut by the center sills.

In freight service the Sudan Government railway has a number of 30-ton open steel cars of double bogey or two truck type and also 30-ton covered cars in both of which the side sills, center sills and cross members are 9 in., 21 lb. channels, the four central cross members being cut by the center sills, while the main cross members or body bolsters extend in one piece across the frame. The trucks of these cars have pressed steel frames with a wheel base of 5 ft. 6 in., and are placed at 22 ft. 11 in. centers. The 10-ton covered two truck cars for freight service have their side sills, center sills and cross members all of 7⅞ in. channel section, the underframe being trussed by 1¼ in. tie rods with queen posts 6 ft. ½ in. apart. The 10 ton open cars of this type weigh 22,400 lb. In the 30 ton two truck cattle cars, which have a weight of 32,500 lb., the side sills, center sills and cross members are all 9 in. 21 lb. channels with 1¼ in. truss rods on the side sills. In the 15 ton covered and open single truck steel cars the underframe members are all 9 in. channels, while the sides, floors and ends are of 3/16 in. section.



Steel Framing for the Metropolitan District Car

Steam Carriages.—Some of the members of the committee of the House of Commons now sitting, on steam carriages, having expressed a wish to be enabled to judge for themselves as to the practicability of a power so long suspended by legislative prohibition, in the shape of tolls, were invited a day or two since by Col. Sir Charles Dance, who is just returned from the continent, to accompany him in his steam-carriage on a trip to his house at Hartford, near Stanmore. The invitation being accepted, the carriage started with a party from Oxford street, at half-past nine in the morning. At Hartford a dejeune was provided by the care of Sir Charles; after partaking of which, and witnessing some experiments in drawing heavy weights by a steam-carriage (with a view to military purposes), the party set off on their return to Oxford street, which they reached at half-past twelve, having accomplished the distance in forty-five minutes. On the journey out the carriage went up Stanmore hill at the rate of eight miles an hour, although this is an ascent where the mail and stage coaches generally make use of six horses. Besides Lord Darlington and other members of the committee, the Master General of the Ordnance and several other distinguished persons were of the party.—*From American Railroad Journal, August* 15, 1835.

FORM FOR NOTING FREIGHT CAR REPAIRS

BY WILLIAM J. KELLY

Little system seems to be followed in methods of recording results of the inspection of freight cars on the repair track. When inspecting a string of bad order cars one or two men are usually assigned to the work, sometimes one on each side of the track. On some roads the method employed by the inspectors to call the attention of the repair men to the defects is to note them on the side of the car with chalk. On others the defects are noted on any piece of paper which happens to be handy, afterwards being copied into a book provided for that purpose. This method requires extra work in making the permanent record and does not leave a record on the car for the repair men.

The writer believes that for this purpose the form shown in the engraving possesses a number of advantages. It should be printed on cards stiff enough to stand tacking on the side of a car. The defects are noted on the card by one of the inspectors or by a clerk accompanying the inspectors. The card is then tacked on the side of the car where it serves as a guide for the repair men. As each man finishes a job he notes the repairs made and the material removed and signs the card. This gives a clear record of the progress of the work at any time and shows just who is responsible for each job. When the repairs have been completed the cards may be removed from the car and filed.

A. B. C. R. R.

STATION Harrison, Iowa

	END	CAR NO. 56832 CO. N.Y.N.H.&H. DATE 7/25/14 INSPECTED BY Joseph M. Yesko John A. Steele			
		REPAIRS NEEDED	REPAIRS MADE	MATERIAL REMOVED	REPAIRED BY
	B	Coupler 5x7 Shank	One (1) New Pitt	One (1) Major Coupler	
		9½" Butt	Coupler	5x5 Shank 6½ Butt	
				Broken at N.	J. Brewing 26
	B	Brake Beam	One (1) New "Creo"	One (1) Wagstaff Brake	
				Beam	
				2 Compression Members	
				Broken	R. Payne 17
	a	Brake Hanger	New (2) K.K. Clevis		
		Clevis Bolts	Bolts 5x¾		J. Burns 12
O	a	Wheels 5x9	One (1) New Pair	One (1) Pair 5x9 Wheels	C. Fisher 29
		Cut Journal	5x9	Cut Journal	A. Mathews 6
		Journal Bearings	Two (2) New Journal	Two (2) Journal	M. Moran 5
		5x9	Bearings 5x9	Bearings	D. Holland 33

Form for Recording Freight Car Repairs

SHOP PRACTICE

MASTER PAINTERS' CONVENTION

The forty-fifth annual convention of the Master Car and Locomotive Painters' Association was held in Nashville, Tenn., September 8 to 11, inclusive, Oscar P. Wilkins, master painter of the Norfolk & Western, presiding. The convention was opened with prayer by Mr. Spain, secretary of the Nashville Y. M. C. A., and the association was welcomed to the city by W. S. Mitchell, chief of factory and shop inspection of the state of Tennessee. Mattison Wells, private secretary to the mayor of Nashville, also welcomed the association to the city.

PRESIDENT'S ADDRESS

President Wilkins spoke of the value of these annual conventions, and called upon the members to co-operate in the exchange of ideas, as without this the association could not hope for success. The master painter should be progressive, seeking to increase the efficiency of his department. Attention was also called to the necessity of developing young men in the painting trade who will be called upon later to take charge of departments.

TEST COMMITTEE REPORT

From inquiry it has been found that new roofs have to be applied to steel cabs about every ten years, and in every instance the old roof was worn out at the point where the rain guard was applied. This catches the coal dust, soot and cinders from the stack, which with water forms an acid which very easily eats through the paint and destroys the roof. This condition is in a lesser degree also found to exist wherever an angle iron or molding was attached to the body of the cab. The steel underframes of tenders and cars are also exposed to deterioration and destruction from acids to a greater degree even than the steel cabs. It is, therefore, necessary to carefully watch these structures and keep them well paintd so far as possible with a paint that will resist this acid action. The committee recommended a mixture of red lead and ferric oxide, or any of the many pigments that have a tendency to minimize the oxidizing influence of red lead for a primer for steel frames, roofs, etc., this mixture to be mixed with linseed oil. This primer should be protected with a second coat of paint that will give the greatest possible resistance to the action of acid and moisture, to which this class of equipment is exposed. The committee then exhibited some test panels of different kinds of paint that had been placed under tenders in various parts of the country. From these tests it was determined that the plates on which were applied and baked the standard class of paints and varnishes are in better condition at every point where exposure was made. It was also conclusively proved that the baking process retains a luster of the varnish and is more free from checks than the air dried plates; that baking is not detrimental to the appearance of the equipment, and as it presents a firmer surface to the elements it is reasonable to presume that it would be more economical to maintain in a sanitary condition. It was also shown that one coat of enamel is better than two coats of flat color in both appearance and durability.

The report is signed by J. W. Gibbons, chairman, H. Hengeveld and A. S. Baldwin.

PAINTING STEEL CARS

A. J. Allen (D. L. & W.): The most essential part of the painting begins with the man who inspects the cars while they are being built, for a job well started does away with two-thirds of the trouble. The greatest of care should be exercised in seeing that every concealed part is well painted with some good elastic paint and especially all joints should be red-leaded, for I do not think that anything has as yet been discovered to take the place of red lead. In putting on the insulation on the inside of the sheathing a cement or paste is used to help stick it before putting on the strips, etc. This cement or paste in one case had eaten the life out of the paint. It probably contained an acid of some kind, presumably carbolic, which had left the paint just as so much dust. Where the cement had not been applied, the paint was in splendid condition.

The roof and deck are very important. If it is thoroughly cleaned before painting and well painted, it will save endless trouble. Where it is possible, every sheet that goes on a roof should be sand blasted, and primed with red lead immediately afterward. We have experimented with various primers, but finally came back to red lead for roofs. We sand parts of the roof most exposed to flying cinders. The system of roof painting we are following at present, and which has been very satisfactory is red lead, followed by two coats of an elastic paint. Roofs are also given a coat between shoppings at the terminal wherever possible. They must be kept well painted.

We have experienced no trouble in painting or taking care of the body of a car. This, if done according to a system, and the proper amount of care taken in applying the different coats, should not cause any more trouble than a wooden coach, provided, of course, that the surface is right to start with. This is very important; every inch should be thoroughly clean and free from rust, grease or scale. In fact, so long as one is using a good reliable paint, the responsibility for the wear rests mainly with the one applying the material.

The following is the method we follow in painting the body: Prime with steel car primer, allowing to stand 72 hours, and if not thoroughly dry let it stand longer; coat again with steel car surfacer and allow 48 hours if possible. If this cannot be done, 24 hours will be sufficient. Follow with three or four coats of surfacer, as the case may require, allowing 24 hours between coats for drying. Guide coat and after 24 hours, rub and allow to stand until thoroughly dry. Apply color. Allow 24 hours and color again. On the following day, ornament. After 24 hours, varnish with one-fourth rubbing varnish and three-fourths finishing varnish. Allow 48 hours to dry, after which apply a coat of clear finishing varnish. Allow 72 hours, then finish. This will take about 23 days. Of course, the time can be shortened considerably, but if it is, the life of the job will be shortened correspondingly.

J. B. Wright (B. & O.): While it has been found that the baking oven has given very good results in painting steel equipment, it is believed that it will not be universally used on account of the expense of painting the equipment in this manner, especially in establishing the plant. This process also eliminates the opportunity for doing other work on the cars while they are being painted. While this is very advantageous from the painters' standpoint, it will require holding a car for a longer time. The surfacers used in painting steel equipment are of great importance. They must be inhibitive and elastic. In order to decrease the number of necessary coats applied a smoother metal surface must be provided by the metal workers. The decks, deck screens and roofs of the steel passenger equipment cars are causing the greatest trouble. These parts should be well painted when the cars are built and carefully watched while in service, repainting as often as necessary for their protection. Our

road has adopted the practice of sprinkling sand in the last coat of paint on the roof in order to eliminate the trouble caused by hot cinders which fall thereon, burning and destroying the paint coating. It is believed that the use of plain colors for finishing the interior of steel cars will be found very much more practical and economical, as with the grained finish it is difficult to repaint parts which frequently become scratched or chipped.

DISCUSSION

John Gearhart (Penn. R. R.): We had the same experience with the cement of the insulation eating off the paint underneath it, and now we apply the insulation using our regular freight car paint mixed very heavy, about 14 lb. to the gallon, for the cement.

H. M. Butts (N. Y. C. & H. R.): We have considerable trouble in keeping the paint on our steel roofs. The same paint applied to tin or wooden roofs shows excellent wear, but when applied to a steel roof it does not wear well at all. The roofs have to be renewed twice a year in order to maintain them at all. It might be that a different metal used for the roofs would give much better service. Since sand-blasting our roofs we have been getting better results. They are now being painted with three coats of Pullman body color paint mixed with pure linseed oil, with no Japan or dryer.

M. L. Shaffer (Penn. R. R.): All roofs are sand-blasted and covered with a coat of primer and two coats of our standard freight car color. I believe if we can get other vehicles for our pigments in the roof paint that we will get better results. In order to get the best results we must carefully maintain the roofs at terminals.

J. H. Pitard (M. & O.): I think we should use thicker coats of paint on the roofs to offset the effects of the rain and sun, and cinders.

W. O. Quest (P. & L. E.): It does not make any difference how much you sand-blast your car if you use a poor paint. Something that has not life enough in it to last six months, it seems to me, is pretty poor. We need oil, for oil is the life of paint; at the same time we should not use dryers, and the further away we get from the hard oxidizing matter on the steel roofs the better the results will be.

H. J. Bruning (L. & N.): The following formula which we use for sand-blasted paint without any trouble may also be applied to the roof. We take 5 lb. of dry Printz metallic paint, then 1 lb. of red lead and color that down with lamp black, then put in a half rubbing varnish and half finishing varnish, and add enough turpentine so that it will work well.

INTERIOR FINISH OF PASSENGER CARS

A. R. Given (Can. Pac.): The following method is used for finishing suburban and first-class cars:

These cars are mahogany and a standard mahogany filler is used. It is allowed to dry in well before wiping off. The following day the car is varnished, using rubbing varnish and 48 hours is allowed for this to dry. Japan putty, colored to match the work, is used for filling in. The whole of the work is then sandpapered and well dusted down. Two coats of rubbing varnish are then applied to the suburban cars and three coats to the first-class cars, to be well sandpapered between coats. Each application of varnish must stand at least 48 hours before applying the next coat. The suburban cars are left in the gloss.

On first-class cars, after being allowed to dry for several days, the work is then rubbed down, using No. *F* pumice stone, raw linseed oil and a small quantity of benzine. The sashes are oiled, filled and given three coats of rubbing varnish. The seat arms are oiled and given three coats of rubbing varnish. The foot rests and seat rails are dipped in an acid brown water stain. When dry, they are again dipped in a mixture of 4 parts boiled linseed oil, 1 part turpentine, and, when dry, given three coats of rubbing varnish. The castings and heater pipes are painted with two coats cherry color. The sash beads are dipped in oil and varnished two coats before glazing. All doors, rods and other movable parts are treated in the same manner as the body of the car. The floor of the car is primed, well puttied and given two coats of standard floor color. All trimmings are oxidized.

The following method is used for finishing sleeping and dining cars:

The cars having been carefully sandpapered and cleaned down are afterwards filled, using standard mahogany filler, allowing it to dry in well before wiping off. The following day the car is varnished, using rubbing varnish and 48 hours is allowed for this to dry. Japan putty, colored to match the work, is used as before. The whole of the work is then sandpapered, and well dusted down. Three coats of rubbing varnish are then applied and allowed to dry 48 hours between coats, and well sandpapered between coats. After being allowed to dry for several days the work is then rubbed down using No. *F* pumice stone and raw linseed oil with a small quantity of benzine. Berths, curtain boxes, rods, doors, chairs, etc., are brought up in the same manner as the body of car. Berths are primed, puttied and given two coats of cherry color inside. Backs of seats are oil stained to match the car and receive three coats of rubbing varnish. Headboards are stained and receive three coats of rubbing varnish. Side tables are filled, receive three coats of rubbing varnish and are left in the gloss. The sashes are oiled, filled, receive three coats of rubbing varnish and are rubbed. All cupboard fronts, doors, shelves, etc., are filled. The inside of cupboards is oil mahogany stained, receives three coats of rubbing varnish and is left in the gloss. All kitchen woodwork is oil stained to match the pantry, receives three coats of rubbing varnish and is left in the gloss.

The water tanks are given several coats of aluminum bronze. The pipes are given two coats of cherry color. The heater pipes are painted dark green. The floor of the car is primed, well puttied and given two coats of standard floor color (dark green). Some of these cars have cork floors, which are given one coat of boiled linseed oil and waxed.

The headlinings of colonist, tourist, suburban and first-class cars are of the agasote style. The operation is to prime the back before the carpenters nail it in position; after being nailed up, it is primed. All nail holes and joints are well puttied and sandpapered and two coats of standard color (pale green) are applied, being well stippled between coats. Stencil decorations are put on and shaded. The whole receives three coats of light varnish.

Headlinings of sleepers, diners, observation and parlor cars are of the canvas type and are given a good coat of paint on the back before being put up. After being put up they are treated in the following manner: Before applying the duck canvas to the veneer, all screw holes, joints and other defects are primed and puttied up smoothly, using Japan putty for this operation and allowed to dry thoroughly. When sandpapered down, the whole of the veneer is now given a good coat of strong glue size. It is then ready to receive the canvas. The canvas having been previously cut to the required shape is given a coat of paste which is a mixture of glue and flour. After sizing the canvas it is allowed to stand for a short time before applying. It is then ready to put on, care being taken to rub it well down so as to remove all creases and to give an even surface, also allowing the joints to lap a little to prevent opening up. This operation should stand at least 24 hours to thoroughly dry out. The canvas is then given a good coat of glue size. Two coats of surfacer are applied, being well sandpapered between coats. All joints and other defects are glazed. After the glazing is dry, it is given a good sandpapering until an even surface is obtained.

The canvas is now painted two coats, using a tint suitable for the gilding ground of aluminum leaf. The whole of the ceiling is sized and colored a little to guide the operation. Alu-

minum leaf is now applied, care being taken to see that no parts are missed. A thin coat of white shellac is put on to prevent the edges from curling. A lacquer is then made up and applied, consisting of gamboge and asphaltum, and the whole stippled.

S. E. Breese (L. S. & M. S.): Almost the entire passenger equipment of the Lake Shore & Michigan Southern Railway is finished in mahogany color. On receiving a new car from the body shop, the surface is carefully sanded to remove any particles of dirt, finger marks, glue, etc. After the surface is dusted down, we apply a coat of oil stain, which corresponds to our standard shade. This stain we make from one part Bismarck brown, one part rose lake and 16 parts burnt sienna. This is followed with one coat of paste filler tinted to the same standard shade. After sanding to insure an even surface, one coat of rubbing varnish is applied, over which all nail holes or any uneven places in the wood are carefully puttied. The whole is then sanded with 00 sandpaper and a second coat of rubbing varnish applied. The surface is again sandpapered and a third coat of rubbing varnish applied, which also is sanded, and a fourth coat applied.

We allow as much time as possible for this coat to harden, all of which depends upon the shop's schedule time. Our average shop time for finishing a coach is about nineteen days. After the varnish is in condition to rub, we do so with water and pulverized pumice stone; after washing the surface carefully with water and then drying, we again rub the surface with a specially prepared oil polish and rotten stone, and wipe dry. This concludes the finishing of the wood.

The headlinings are finished as follows:

The same primer is used as on the body outside, and is followed by one coat of surfacer, putty for holes, and two coats of rough stuff. This is rubbed with lump pumice stone and water to a surface, following which three coats of flat color are applied. Over this we put our decorations, followed by three coats of rubbing varnish. We rub the varnish with pulverized pumice stone and water, then oil and wipe dry. We do not polish this surface.

We give the saloon three coats of flat white followed by two coats of white enamel. In the first coat of white, we use on an average a pint of oil to a gallon of the white, for a priming coat. The trimming work is carried through in the same manner as described above. The floors are first primed with the same primer used on the body of the car outside, and allowed to dry for several days before the subsequent coats are applied.

J. McCarthy (G. T.): All natural wool filler consists of corn starch made with pure linseed oil to a semi-paste form with a quantity of sienna and other staining colors added to give the wood finish the required shade. The filler is thinned down with benzine to a working consistency and when applied and sufficiently evaporated it is wiped across the grain of the wood, wiping the surface dry and leaving the open grain well filled. The staining colors ground in japan for coloring the filling and putty, and for staining, are generally superior in quality and not so liable to fade as the colors ground in oil. A good grade of white shellac is always used.

RUST INHIBITIVE PAINT

J. H. Pitard (M. & O.): All paints are rust inhibiting only in proportion to their adaptation to metal protection, and the term of their protective qualities is not indefinite; it is rather in proportion to the care that is taken to renew them when such paints reach the end of their natural life and before rusting has begun to appear. In the writer's experience, the best results have been obtained by the use of red lead and linseed oil for first or under coats, followed by one or more coats of carbon black. In the discussion of this subject regarding the fitness of paints for metal protection, the question of preparation of the surface is an important determining factor and should receive due consideration where the maximum durability is desired or expected. The nearest approach to a rust inhibitive paint is the result of combining chemicals and conditions of application in such a way as to make them mutually supporting.

CLASSIFICATION OF REPAIRS

J. F. Gearhart (Penn. R. R.): We classify the exterior repairs on our cars separately from the interior, the exterior being designated by numbers and the interior by letters. We have our piece work prices for each operation for any of the different classes in detail, and with the exception of the amount of scraping or new work to be done on a car, we are able to tell at a glance what a car will cost. We have our organization divided into service men, liners, who do the varnishing, and inside men. We know how much the panels are worth, and by carefully going over the car we can tell in a few minutes exactly what the car will cost to be repainted. We are not asked to give an estimate on any car, unless it is something special.

Mr. Hengeveld moved that it was the sense of the meeting that cars should be classified separately inside and out, which was seconded and carried.

PAINT SHOP APPRENTICE SYSTEM

B. E. Miller (D., L. & W.): The apprentice system on the Lackawanna Railroad is organized on lines corresponding closely to those followed on many of our larger railroad companies. Schools of instruction in charge of a supervisor of apprentices are maintained at three of our principal shops, namely, Kingsland, Scranton and Buffalo. These have been in operation during the past four years and attendance is compulsory, which naturally includes paint shop apprentices. Apprentices are entered between the ages of sixteen and eighteen. The average age upon entering is sixteen and one-half years.

A four-year course is prescribed for all the trades and a total service of 10,000 hours is required before a diploma is granted. The pay is raised every 2,500 hours from 8½ cents an hour for the first period to 11½, 15 and 18 cents an hour for the following three periods. Upon the recommendation of the shop and school instructors of apprentices and the general foreman, with the approval of other officials, a diploma may be granted after serving three years of 2,500 hours each if the apprentice believes himself capable of earning a mechanic's wages.

No hard and fast rule is followed as to assignment and periods of service in the various classes of work into which the four-year term is divided. Much depends upon the boy himself and his aptitude to master the tasks put before him. With some variations, largely unavoidable, the following schedule is adhered to at Kingsland, our principal shops, where both passenger car and locomotive work is handled: general locomotive work, varnish room work, general work on floor, body work and surfacing, interior finishing, general work and glass plating, and striping and lettering, the changes being made every six months. During the last six months the work is governed by the conditions of the shop.

During the fourth year of their apprenticeship, we permit working on a piecework basis, the earnings being prorated if employed with other workmen. The privilege, however—entirely at the option of the company—is extended only to boys sufficiently advanced and entitled to it because of meritorious conduct.

It is to be regretted that from an educational standpoint, the average applicant for a position as an apprentice on railroads generally is apt to be somewhat lacking. It is particularly difficult to secure good material for paint shop apprentices, the advantages offered in the machinist and other trades having a tendency to draw towards themselves the most desirable of the applicants.

The apprentice schools on the Lackawanna railroad are in charge of a supervisor of apprentices and an assistant, and are maintained entirely at the expense of the company. Every apprentice is compelled to attend three hours each week. A set of drawing instruments is provided for all pupils, which, however, they are expected to pay for on the instalment plan, small sums to apply being withheld from their pay, periodically. In-

structions are given in mechanical drawing, free-hand drawing, arithmetic and writing.

For the benefit of paint shop apprentices, an additional list of studies has lately been added, of particular interest to them. The subjects taken from text books and other sources of information are as follows: brushes, car coach and carriage painting, color, color harmony, color mixing, oils and japans, staining, varnishing, enameling, flatting and gilding. It is expected that the study of these subjects will prove of great interest to the boys and that they will impart to them much essential knowledge otherwise obtained in a haphazard way, if indeed in some cases it is acquired at all.

Of the men that have taken the paint shop course 25.35 per cent of all apprentices employed during 14 years are still in service. The greatest number leave during the first year of service, the percentage being 45.09. The percentage leaving the second year is 8.45, and for the third and fourth years the percentage is only 2.82 and 2.81, respectively.

Martin L. Shaffer (P. R. R.): In a piece work shop there should be established, where practical, an apprentice gang, to be composed entirely of apprentices; for example, an apprentice serving his first year, one in his second, one in his third and one in his fourth year; as an apprentice serves out his time a new apprentice to be employed so as to keep the gang on a working basis as explained above. These apprentices should be under the supervision of a practical painter, that they be given their work and permitted to start and finish it; all work to be performed on a day work basis with an increase of wages approximately two cents ($0.02) every six months, this to be based on their employed rate.

DISCUSSION

J. W. Gibbons (A. T. & S. F.): If we could get our apprentice schools to take up part of the time teaching the painter apprentices elementary lessons in chemistry as pertaining to paints and oils, it would be of great advantage to the future generation of painters and to those who may employ them.

REMOVING PAINT BY SAND-BLASTING

W. O. Quest (P. & L. E.): We are firm in the belief that the sand-blasting method of cleaning metal or stone surfaces is the best, the most effective and the most economical to use. This preparatory cleaning must be figured upon regardless of cost in order to avoid making the costly mistake of painting over live corrosion or mill flash scale. If a sand-blast system is properly installed and handled its work can be depended on for a maximum of service results. The average cost of removing paint, etc., from an 8,500 gallon tender tank by the sand blast is a fraction less than eight mills per surface foot, and the total piece work price is $3.33. The same tank cleaned with the best known non-dry-hardening caustic mixture, soluble in water, will cost $7.10, and even then the flash scale will not be wholly removed. The cost of chemically removing the flash scale, and of neutralizing the acid used is prohibitive. This leaves the sand-blast as the only practical metal cleaning method that will provide a clean, inert surface to receive paint. A coarse clean sand should be used. The sand-blast may also be used to good advantage in cleaning the metal prior to welding by electricity.

At the McKees Rocks shops all large sand-blast work is done in an elevated track sand storage house. The sand used for blasting is used again for sanding locomotives. This also eliminates the trouble from dust in other shops. The sand-blast can also successfully be used for glass ornamentation work, and is, in fact, superior to the acid method of cutting. There are, nevertheless, cases where the chemical removers can be used to much better advantage than the sand-blast, especially on small castings, driving wheels, dome and sandbox base castings.

F. A. Weis (C. R. R. of N. J.): The sand-blast not only removes the paint, but also the rust and flash scale, and at the same time roughens the metal just enough to allow the paint which is applied to adhere firmly, better than it could to the original planished surface, and this firm adhesion not only protects the metal surface better, but insures longer life to the paint. Moreover, the operation of sand-blasting, when it is properly done with dry sand, produces a clean surface that is absolutely free from moisture or possible traces of chemicals or wax that might cause corrosion of the metal or prevent a firm adhesion of the paint to the surface.

The sand-blasting operation consumes about as much time as is required to apply the remover and the labor for removing the old paint would be an additional cost over blasting. This leaves the cost of the remover to compare with that of the sand, compressed air and maintenance of the blasting plant, which is also in favor of blasting. However, I have found the use of remover to be the next best method to sand-blasting.

DISCUSSION

John G. Gearhart (Penn. R. R.): Our sand house is now arranged so that two operators can work on a car at the same time, the car moving along past them.

H. M. Butts (N. Y. C. & H. R.): We expect to sand-blast everything that needs it, and are planning for a building that will contain two cars so as to prevent moisture accumulating on the cars before the priming coat is applied. We have experimented with paint and varnish removers of various kinds, but none are as effective as sand-blasting. We have sand-blasted one of our first-class vestibule cars with two men in five hours, but it takes on an average 7½ hours.

Other members stated that a car could be sand-blasted in 10 hours with a helper, and instances were mentioned where 60-ft. mail cars had been sand-blasted at a cost of $9 a car. Regarding the number of times it is possible to use the sand, it was stated that it depends on its quality, and many have not found it possible to use it more than twice.

STANDARD FREIGHT CAR LETTERING

The standardizing of freight car lettering was strongly favored by the association, and many instances were mentioned where, on account of the lettering not being standard, considerable trouble had been caused. The following resolution was adopted in this regard:

"Whereas, The Master Car and Locomotive Painters' Association recognize the advertising value of the trade marks of the railroads that have been in use for years, and realize it would be useless for us to ask them to dispense with this invaluable medium of reaching the public, but

"Whereas, A uniform stenciling of freight cars is very desirable from the standpoint of shop efficiency and economy, and efforts have been made in the past, both by this association and by the M. C. B. Association, to accomplish this end, with more or less success; be it therefore

"Resolved, That we renew our efforts to arrive at this desirable end; and that we appoint a committee to design a series of letters and figures for this purpose, said committee to confer with the M. C. B. Association for its general adoption on all railroads."

OTHER BUSINESS

The secretary reported a membership of 292.

The following officers were elected for the ensuing year: President, T. J. Hutchinson, formerly of the Grand Trunk; first vice-president, H. Hengeveld, Atlantic Coast Line; second vice-president, John F. Gearhart, Pennsylvania Railroad, and secretary-treasurer, Alfred P. Dane, Boston & Maine. Detroit received the greatest number of votes for the next place of meeting.

LABOR CONDITIONS IN MASSACHUSETTS.—Labor conditions are the worst since 1908 in Massachusetts, according to the State Employment Bureau. In a single day, recently 3,000 people applied for work, with only 82 positions available.—*Iron Age.*

RECLAIMING MATERIAL ON THE FRISCO

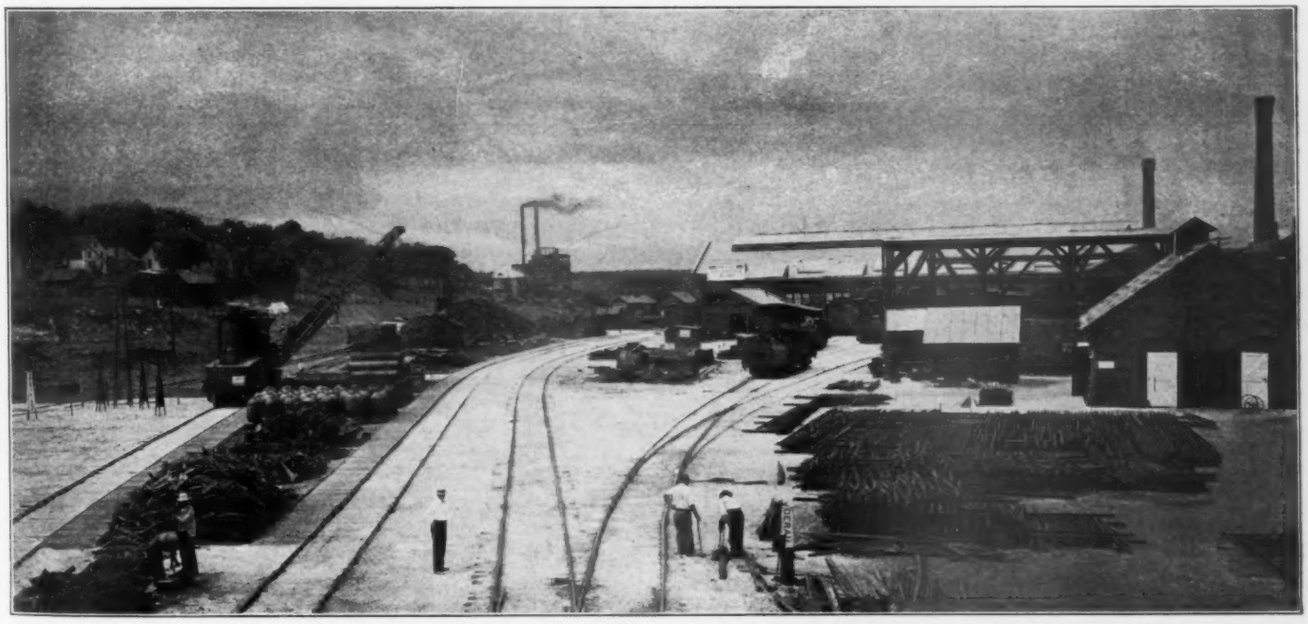
Large Plant Established at Springfield for This Purpose Is Developing Surprising Results

The reclamation plant of the St. Louis & San Francisco, established at Springfield (Mo.) a little less than a year ago, has many features of special interest. In the first place, it is housed in what might be termed "scrap buildings on scrap property." This, however, is not nearly as bad as it sounds, for the buildings, at least the two main ones, are of substantial construction and were originally built as the main shops of the Kansas City, Fort Scott & Memphis, but were practically abandoned when the new Frisco shops were built on the other side of the town several years ago. The plant is located about one-quarter mile south of the passenger station at Springfield. That part of the yard which is used for the unloading and storage of scrap formerly consisted in large part of the low, uneven and eroded slope of a creek. This has been leveled and filled except for the channel bed and serves its purpose admirably, as indicated in the general views of the plant.

A General View of the Reclamation Plant of the St. Louis & San Francisco at Springfield (Mo.)

The buildings are kept well painted and a more or less successful attempt has been made to keep the plant in a neat and orderly condition. From the very nature of things this is a difficult task, but the moral effect upon the force, particularly in a plant of this kind, cannot but be felt in the results which are obtained from its operation as a whole.

The scrap which is collected from the various divisions and shops is delivered to the reclamation plant at the rate of about 4,000 tons a month. The force required for handling and sorting it and carrying on the work of reclamation consists of about 255 employees. These are in direct charge of a superintendent, who reports direct to the chief purchasing officer, and include a general foreman, a dock foreman, an office staff of six men, a machine shop and air room force of 15 men; 14 men in the bolt shop, 37 in the blacksmith shop, five in the track material and frog shop, 14 in the carpenter shop, eight in the Oxweld department and about 150 in the miscellaneous force.



General View of Scrap Yard and Reclamation Plant

As the cars containing scrap arrive they are unloaded by a Brown hoist equipped with an electric magnet. The sorting is done by small gangs of men under the supervision of a foreman who thoroughly understands material. A large part of the scrap is of no use as far as re-application to cars and locomotives or

roadway is concerned and this is merely sorted into piles according to the class and grade and is again loaded on cars by the hoist and shipped and sold to scrap dealers. The remainder, possibly from 20 to 25 per cent of the total, furnishes the basis of the reclamation plant's profitable operation.

In developing this work of reclamation, it was recognized

A Group of Bolt Cutters in the Machine Shop

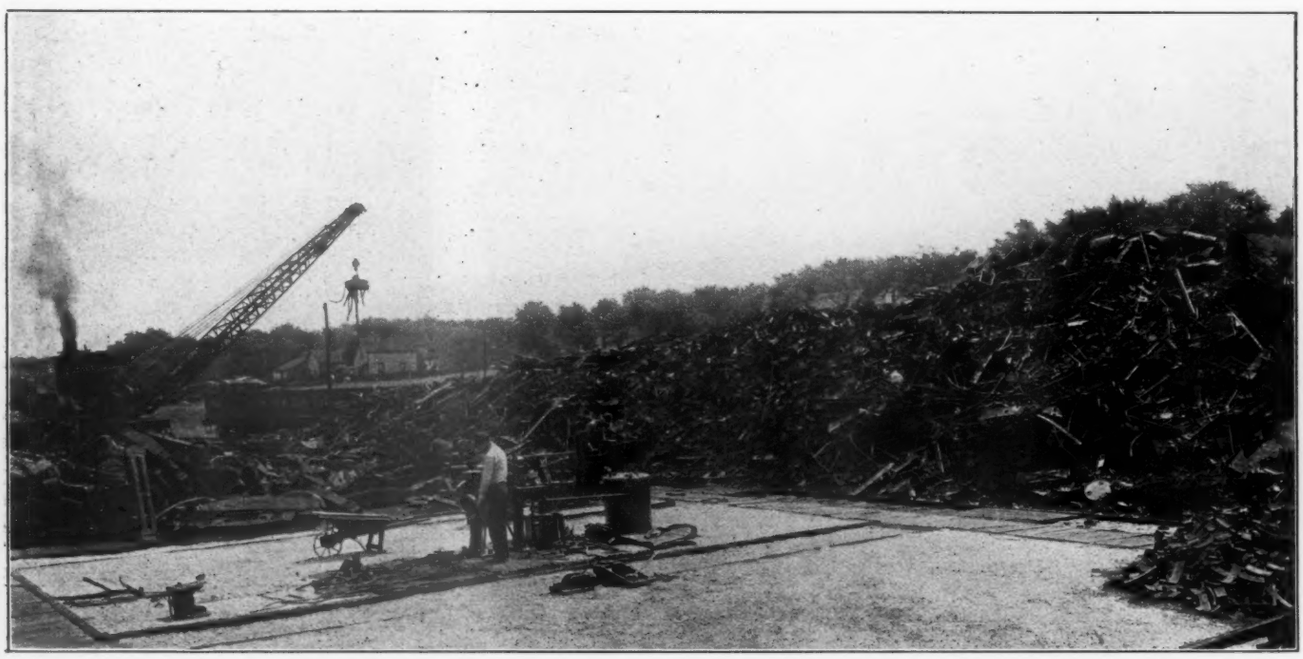
that it might easily be overdone and thus neutralize all of the gain which could be made if the efforts were concentrated on that part which might be reclaimed with profit. To guard against mistakes of this kind each item is carefully studied and analyzed and where there is any question as to the strength or durability of the part for the purpose for which it is intended, efforts are made to follow it into service. As all of the reclaimed metal parts are dipped in an asphaltum mixture before they are sent to the shops and storehouses, it is easy to spot them in the storehouse stock and to recognize them when they are replaced on cars and locomotives. It is thus possible to more or less readily locate any breakage or failure on a large scale of parts which have passed through the reclamation plant. The mechanical department officers are constantly on the lookout for possible cases of this kind.

As may be seen from the photographs, the main buildings which house the machinery are located at one end of the scrap yard. The other smaller buildings, which have been constructed at a comparatively small cost from scrap lumber and old metal car roofs, are so located as to facilitate the movement of the various classes of material which they handle, cutting down lost motion and wasteful moves to a minimum.

BOLTS AND NUTS

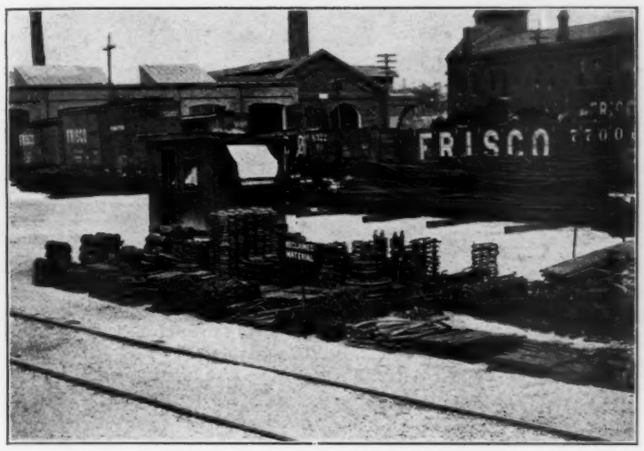
All the bolts which are sorted from the scrap are sent to one of the smaller buildings, which is equipped with a shear and three small air operated hammers. The damaged ends are cut off and the bolts are straightened under the hammers. They are then sorted by diameters and lengths and are sent to the machine shop, where they are re-threaded. There is provided for this purpose one single-head bolt cutter, three double-head machines and one triple-head machine. The scrap nuts are first annealed and are then placed in a rattler and cleaned; they are then sorted in sizes and retapped on four tapping machines, each of which is equipped with seven spindles. In all cases nuts are

Two of the Multiple-Spindle Nut Tappers Which Were Reclaimed from Scrap



Unloading Scrap With a Three-Ton Hoist Equipped With an Electric Magnet

screwed on the newly threaded bolts before they are sent to the storehouse. It is true that before the establishment of the reclamation plant, many of these bolts and nuts were reclaimed. It was a more expensive process, however, because the machines were scattered at the different shops and were not worked as efficiently as is possible where they are grouped together in one department and have a sufficient amount of work to keep them working to capacity at all times. In all cases it has been found possible to speed up the machines and thus increase the output.



Good Material Which Has Been Picked from Scrap for Future Use

Practically all of the work in the reclamation plant is done on a piece work basis.

A large number of new bolts and pins are also made from round iron which is taken from the scrap, straightened and cut to proper lengths. For the heading of these bolts two machines are used which were reclaimed from scrap. Practically all of the bolts which are required on the railroad are now being reclaimed or made at the reclamation plant. During one month 157,082 machine bolts were reclaimed or made from scrap or new material at an estimated saving of $1,953.50 as compared to the value of new bolts. This is on the basis of direct labor and material cost, plus a proper allowance for supervision and overhead expense.

AIR BRAKES AND AIR HOSE

The main building, which contains the machine shop and the bolt and nut machinery, also has a section for repairing and cleaning air brake apparatus and for working over air and steam hose. The hose and fittings are first stripped with home-made devices; about 90 per cent of the fittings are practically as good as new when they have been cleaned and new gaskets have been applied. The greater part of the hose is useless, although a certain proportion of it is fit for splicing and using on work equipment or for working over for dummy hose. In one month, for instance, 230 steam heat hose were overhauled, the old fittings being applied to new hose in most cases. In the same way 2,505 air hose were overhauled, 706 air hose were spliced and 53 dummy hose were fitted up.

A Pile of Shovels with Broken Handles and Bent Blades Is Shown at the Right and a Number of Repaired Shovels at the Left

In this department triple valves, angle cocks, relief valves and various other pipe and air fittings are overhauled and placed in a serviceable condition, often at a comparatively small expense. A typical month shows the overhauling and reclaiming of 247 angle cocks, 29 cut-out cocks, and 283 globe valves.

A large portion of this same building is used for the repairing

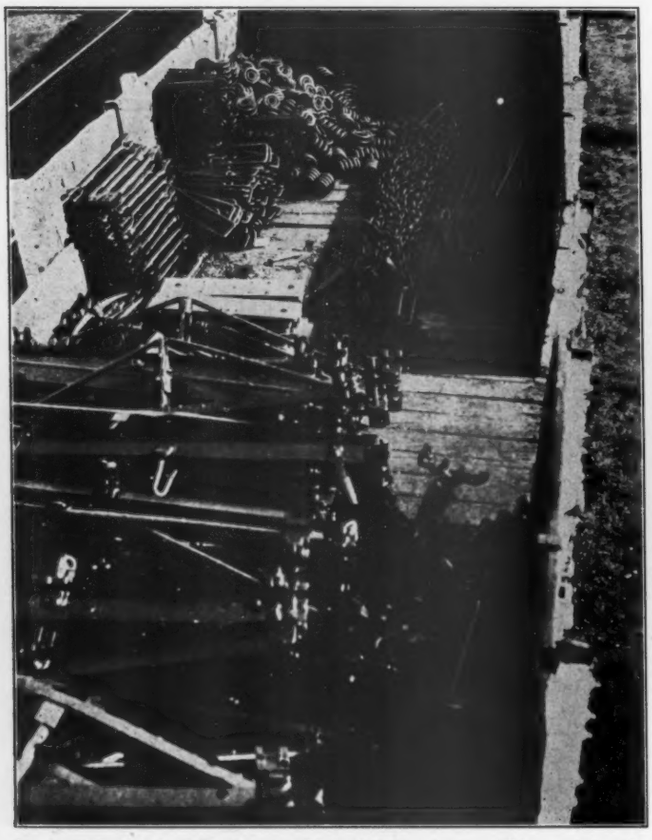
Reclamation Plant Machine Shop

of damaged lanterns, markers, gage lamps, classification lamps, switch lamps, oil cans and other locomotive supplies. The item of locomotive supplies will probably not amount to a very large factor, however, because of the steps which are being taken by the mechanical department to standardize and give special attention to the proper use and maintenance of this material.

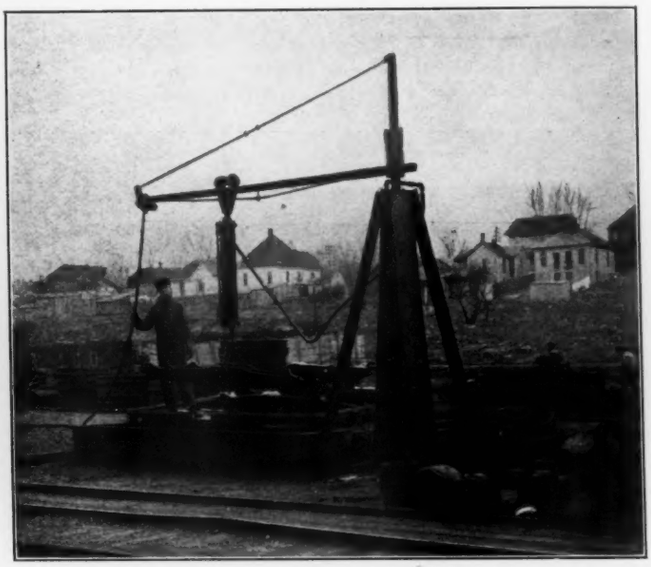
Pneumatic Spike Straightening Machine

ROADWAY MATERIAL

A large part of the main shop is used for the rebuilding of damaged hand and push cars which are picked up and sent to the reclamation plant as scrap. In some cases where the cars are badly damaged it may require the good parts from two or three cars to make a new car. When this has been done and the car has been properly painted it is usually difficult to tell it from a new car. This is also true of baggage trucks, track drills, jacks, track levels and station skids. As an example, one month showed the reclaiming of 23 track jacks, 45 hand cars, 6 baggage wagons, 48 warehouse trucks, 8 push cars, and 5 station settees, with an estimated saving of approximately $1,000.



Part of Carload of Reclaimed Material Ready for Shipment to the Store Department



Crane and Vat for Immersing Reclaimed Material in Mixture of Asphaltum

Another part of the shop, which is of more than ordinary interest, is that in which the shovels, scoops and scythes are rehandled and straightened up. This portion of the shop is shown in one of the photographs. The 12 in. shovels are cut back a maximum of 2 in. About 90 per cent of the shovels which come to the reclamation plant in the scrap may be reclaimed in this way. A typical month shows the reclaiming of 418 track shovels with a saving of between $90 and $100.

The Oxweld Station at the Reclamation Plant

Another special feature is that of cable repairs. A large amount of valuable material of this sort is lost on many roads because of the lack of an expert in splicing and repairing the

cables. Realizing this, the superintendent of the reclamation plant deliberately set out to locate a competent man to do this sort of work, preferably with experience in the navy. The result has been most gratifying.

BLACKSMITH SHOP

The blacksmith shop works over a large number of parts which come to it more or less damaged, and manufactures a considerable

Welding Car Bolsters with the Oxy-Acetylene Process

amount of material from scrap. It is showing a profit of from $1,500 to $1,800 a week. Track tools of all kinds, including adzes, spike mauls, clay picks, claw bars, lining bars and tamping bars are straightened and re-dressed. Broken coil springs are heated and drawn out with an air machine and are then made into jack bars, lining bars, drift pins and similar parts. A large shear is provided for shearing the coupler yoke rivets and

Repairing Car Bolsters, a Journal Box and a Coupler with Oxy-Acetylene

the good parts are reclaimed. A shear is provided for cutting bars and rods to length. A considerable number of brake rods are straightened and in many cases new ends are welded on.

The manufacture of material from scrap relieves the blacksmith shops at the different shop plants of much of this work. For instance, round iron is cut into suitable sizes and headed for bolts and made into pins; bar iron which comes to the plant as scrap is worked up into drawbar shims, carrier irons and other locomotive and car parts. One end of the smith shop is used for relining journal brasses. Exceptional results have been obtained by welding carbon steel points on picks. These have given good service and are said to be better than new tools.

TRACK SPIKES

Hundreds of track spikes are annealed and reclaimed each day. As these are sorted out from the scrap pile they are transferred to a small building which is fitted with a pneumatic hammer and is used only for the straightening of spikes. Such spikes as do not come up to a certain standard are, of course, scrapped, but the large number that can be reclaimed is surprising. Scrap washers after being rattled with the spikes, nuts, air hose couplings, etc., are treated in the same way.

CEMENT SACKS

Cement sacks used in connection with construction work are carefully gathered and forwarded to the reclamation plant.

A Broken Coupler and a Similar One Which Has Been Repaired by the Oxy-Acetylene Process

Usually these are torn and damaged from rough handling in opening; an old box car has been fitted up for handling these and one of the older employees gives all his time to sorting and repairing them. As many as 1,365 sacks were reclaimed in one month, resulting in a net saving of about $84.

OIL AND WASTE

One of the smaller buildings is equipped with electrically driven centrifugal separators which thoroughly clean the soiled

Broken Signal Post and Relay Box Awaiting Repairs

and oil soaked waste which has been taken from journal boxes, and also reclaims the oil. The net return from this department runs from $200 to $300 a month.

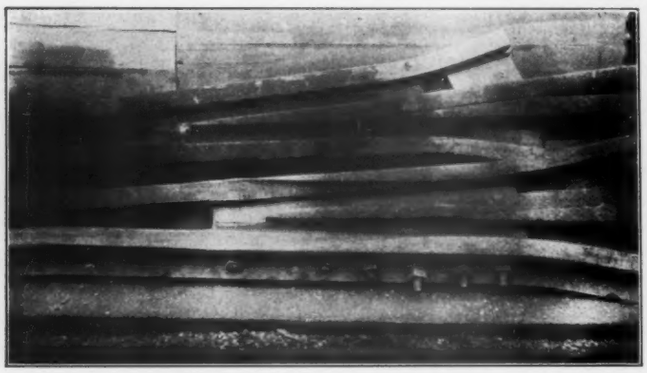
BRASS SCRAP

Special attention is given to the brass scrap because of its value, even as scrap. A small house has been built from old car timbers and metal car roofs which has a number of bins for the different

classes of brass, a scale being placed at the entrance to the building in order accurately to keep a check on all of the material.

BRAKE BEAMS

The reclaiming of brake beams is segregated in a small building because of the danger of flying rivet heads in stripping. All brake beams which are not too badly twisted or damaged



A Worn Crossing Frog and a Similar One Repaired by the Oxy-Acetylene Process

are straightened in a bulldozer and are refitted with new heads and fulcrum castings if necessary. Truss rods for these beams are made in the blacksmith shop from scrap material. Brake hangers which have been damaged or distorted are straightened and fitted for further use. In one month 1,692 brake beams were reclaimed with a saving of almost a dollar a beam, and 456 brake hangers were reclaimed.

OXWELD PLANT

Probably the most interesting part of the plant and that in which the most spectacular savings are made is that in which the oxy-acetylene process is used, either for welding or for cutting. The generating apparatus and the oxygen tanks, as well as the supply of carbide, are housed in a small building centrally located. The piping at the reclamation plant is entirely underground and consists of about 1,000 ft. each of pipe for oxygen

Cutting a Scrap Underframe, Thus Saving the Usable Parts and Securing a Higher Price for the Scrap

and for the acetylene gas. There are 12 outlets or stations on this line and at present a force of eight welding operators is kept steadily at work.

The Shop in Which Frogs and Switches Are Repaired and Reassembled

CASTINGS

One of the most interesting classes of work reclaimed by the oxy-acetylene process is that of castings, whether of cast iron, cast steel, brass or other alloy. Many brake cylinders or air reservoirs with broken lugs are repaired at a very small expense where otherwise it would be necessary to scrap the entire cast-

ing; even if the part which was broken off is not available it is possible in many cases to build up the casting with new material or to break a similar piece off of another scrap casting and weld

Old Boilers and Fireboxes Are Cut with the Oxy-Acetylene Burners into Pieces Convenient for Handling

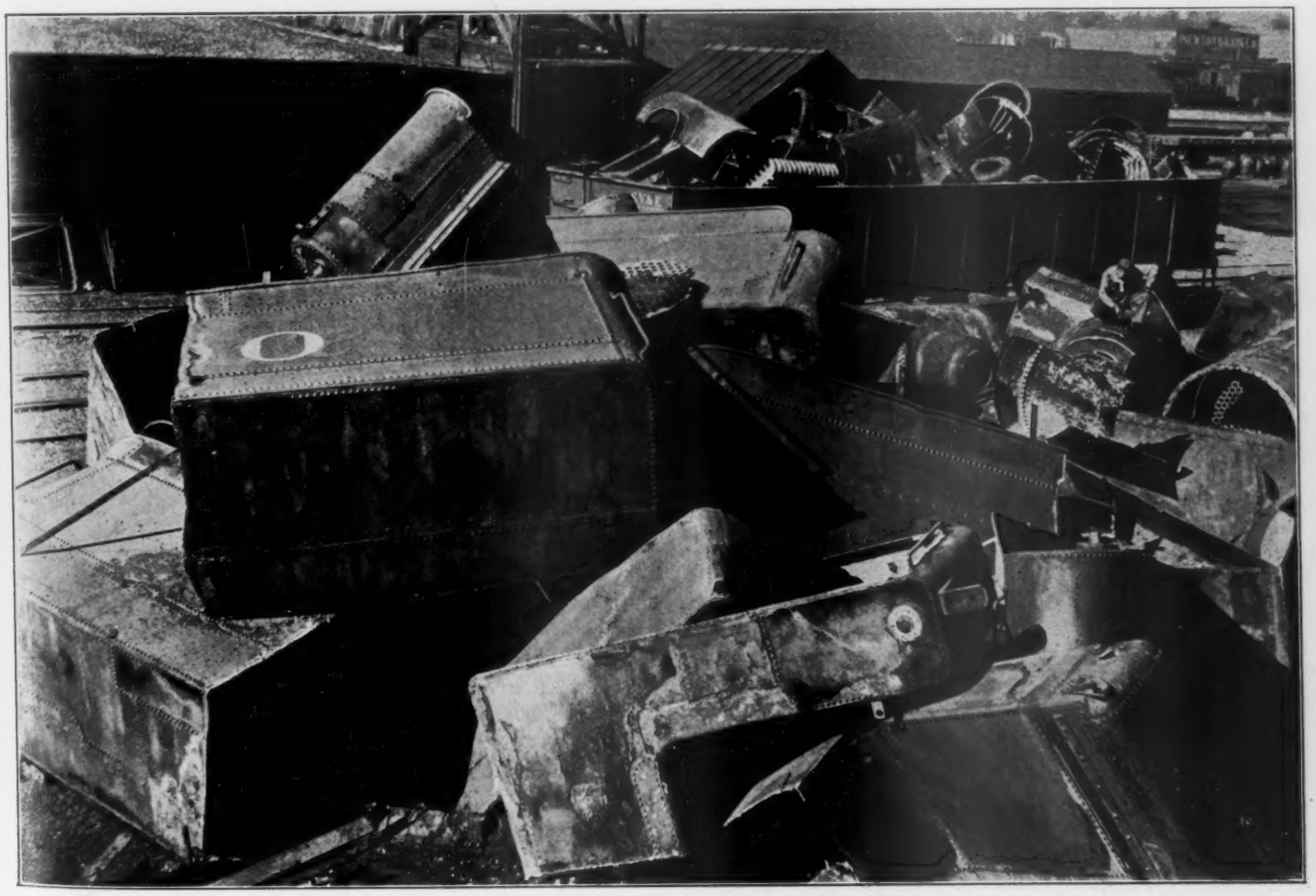
it in place. An important development which has been made necessary is a campaign of education among shop and engine house employees to emphasize the necessity of tying broken pieces of castings, which may be reclaimed, together, so that time may be saved at the reclamation plant in supplying the missing parts.

The illustrations show typical jobs in the reclaiming of castings. As may be understood, the possibilities in this line are practically unlimited. Many cracked or broken car bolsters are welded and reinforced so that they are as good as new, and in some cases, even better. In possibly as many as 25 per cent of these cases the good ends of two badly damaged bolsters have been cut off and combined into one perfect bolster. Many couplers have been reclaimed which were cracked on the face or in the neck of the shank, or which have had broken knuckle pin bosses or lugs; in some cases repairs have been successfully made by filling in worn contours. One of the illustrations shows repairs being made to two bolsters, a journal box, a coupler and a center plate casting.

Locomotive buffer castings which have been broken or in which the holes have been worn out of round are reclaimed at a comparatively small cost. Many cast iron signal posts and relay boxes used in connection with the block signal system are repaired, the cost of welding usually varying between $2 and $3 per casting as compared to from $16 to $24 for a new part. A broken signal post and relay box which may easily be repaired is shown in one of the illustrations.

SWITCH AND CROSSING FROGS

A separate building, the interior of which is shown in one of the illustrations, is used for the repairing and reassembling of switch and crossing frogs. Ordinarily when these become worn they are rebuilt at a high cost. With the oxy-acetylene process the broken points and worn rails are built up to the original standard at a very small expenditure. As a typical case, a frog which costs $45.25 new was reclaimed with an expenditure of $7.50, making a net gain of $37.75. One of the illustrations shows a frog which had become badly worn and a similar frog which



Old Locomotive Tanks Which Have Been Cut to Sizes Convenient for Handling.

had been just as badly worn, but which had been repaired with the oxy-acetylene process. In building up the rails and points the metal is applied over a small area at a time and is hammered down while hot, thus avoiding the necessity of subsequent machining.

REDUCING SCRAP

Several of the illustrations show large parts, such as old boilers, fireboxes, tender tanks and car frames, being cut up with the oxy-acetylene cutting burner. This class of scrap commands a very low price, not more than $2.50 a ton. When it is cut into sizes for convenient handling it will bring at least double that amount; the cost of cutting is comparatively slight, so that there is a net gain of several hundred per cent.

THE SAVING

That the best results may be obtained at the reclamation plant it is necessary for the mechanical department officers over the entire system to understand the work which is being carried on there and to realize the possibilities of co-operation. It is proposed to have all of the master mechanics, roadmasters, general foremen and others who handle material pay periodical visits to the plant to study its workings and its possibilities. By seeing that parts broken from expensive castings are wired to them when they are forwarded to the reclamation plant they can help to increase the saving; in many cases they will send parts for repair direct to the plant rather than to let them take the roundabout method of going forward mixed up with a miscellaneous lot of scrap.

A careful record is being kept of all the work which is done at the plant with the idea of determining as accurately as possible the saving which results. Of course, these savings are not in all cases net, for much of the material, if it were not forwarded to the reclamation plant, would be reclaimed at the other shops on the system. There is little question, however, but that with the special organization at the reclamation plant the work can be carried on more economically and more thoroughly than it can at the other plants, allowing for the cost of transporting the material to and from the plant.

Statements are issued monthly showing the number of different parts reclaimed, the value of the new material used, the value of the scrap material used, the total labor cost, a charge for supervision and overhead expense, and miscellaneous shop expense. This in each case is compared with the cost of similar material purchased new and a column is added showing the total saving for each item and the saving per unit. The officers of the road have given the matter careful attention and thorough study, and are emphatically in favor of the plant. Started as an experiment, it was watched more or less critically with the idea that after all most of the saving might prove to be on paper; that this has not proved true is indicated by the fact that the work is gradually and steadily being extended and enlarged, although in many cases practices have been discontinued because it was found that it did not pay to try to reclaim certain parts. In making out the monthly performance sheet those items which do not show a saving indicate the loss in red and thus attention is focused on them. Needless to say an item showing up on the wrong side more than once or twice means either that prompt attention will be given in the attempt to reduce the cost of reclamation, or no further work will be done on such parts. The plant is in charge of Superintendent R. F. Whalen.

New Method of Measuring Distance.—An ingenious artist has invented an instrument termed a distance register, capable of being applied to two and four-wheel carriages of every description, for the purpose of ascertaining the ground gone over by such carriages in any given space of time, from one minute to the whole day, and which may be employed with equal efficiency in reckoning the course of either steam or sailing vessels.—*From American Railroad Journal, August 22, 1835.*

BURNING OUT OIL DEPOSITS IN AIR PUMPS*

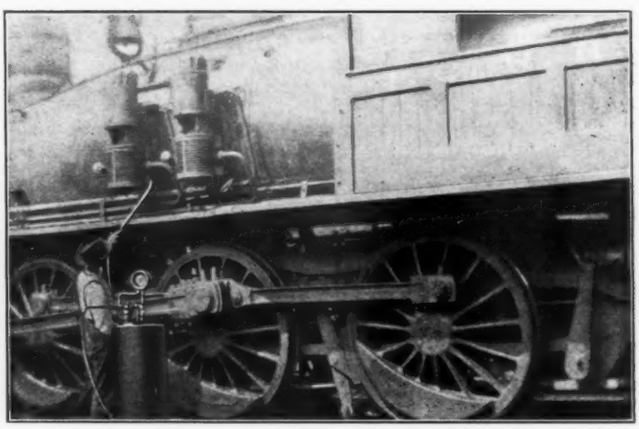
BY W. M. ROBERTSON,
Engine House Foreman, Illinois Central, Harahan, New Orleans, La.

Until recently the methods used for removing the deposits of oil from the air end of air pumps without removing the pump from the engine were very impractical and unsatisfactory. The job meant dismantling the pump at the air end, tearing out all the valves and scraping out the parts by hand. The work was never done thoroughly, it required much time to do it and then there was always the danger of delaying the engine.

This work was revolutionized by the introduction of oxygen carbon removers. This outfit does the work thoroughly and in a very short time. The outfit shown in the illustration will remove every small particle of oily deposit from the valves and other parts. The action is purely chemical and requires no taking down of the pump.

With an oxygen cleaner a pump cylinder can be thoroughly cleaned in ten minutes. This means that it is never necessary to tie up an engine to clean the air pump, and when cleaned in this manner the life of the pump is greatly increased.

The oxygen cleaner consists of an automatic regulating reducing valve fitted with a thoroughly tested gage and about 8 ft. of high-grade hose with 2 ft. of ⅛-in. copper tubing reduced to



Burning Out Oil Deposits in Air Pumps

about 1/16-in. on the point, and a ⅛-in. needle valve at the hose. One of the valves is removed and the opening swabbed out with headlight oil. A small piece of waste is then ignited and dropped in the opening, when the torch is inserted and the oxygen turned on, the oily deposit being rapidly burned away. Only a few minutes is required to burn the heaviest deposits. As soon as the deposit is consumed the burning ceases as the gases have no effect as soon as the cylinder is cleaned.

Where an oxy-acetylene welding plant is used, it is only necessary to have a hose and torch to connect to the regulating valve of the standard welder. The material necessary to make the outfit consists of an auxiliary reservoir, a signal line reducing valve, 8 ft. of ¼-in. hose, 24 in. of ⅛-in. copper tubing, one ⅛-in. needle point valve and a duplex air gage.

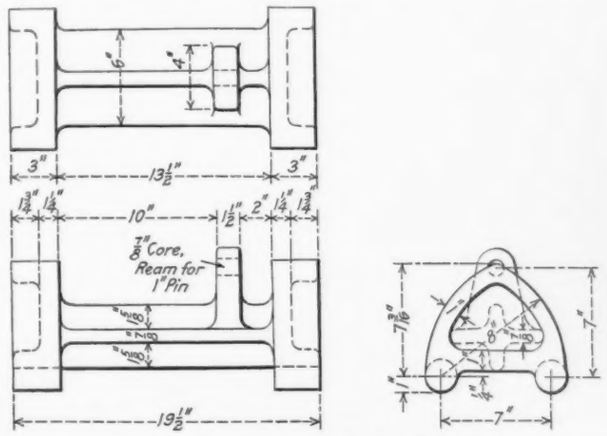
Increasing the Efficiency of the Cutting Torch.—Experiments recently conducted in cutting with oxy-hydrogen and oxy-acetylene cutting torches show that a marked increase in the rate of production is effected by increasing the temperature of the oxygen. The most favorable results secured in this connection show that the increase of speed obtained by preheating the oxygen is 18 per cent, while the saving in the amount of oxygen used was 55 per cent.—*Machinery.*

*Entered in the competition on Engine House Work, which closed July 15, 1914.

NEW DEVICES

RECENT DESIGNS OF ENGINE AND TENDER TRUCKS

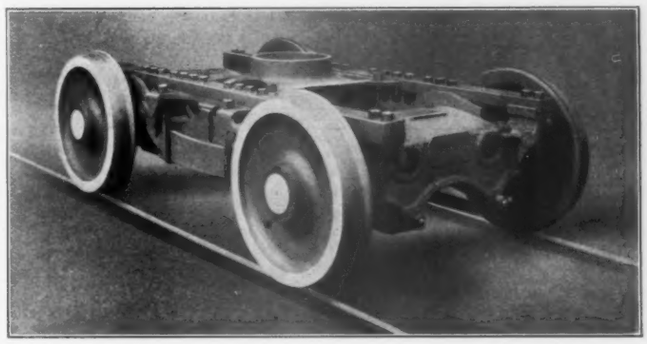
The change in wheel arrangement, together with increased size and weight of the modern locomotive, has imposed a duty upon the leading truck of the prevailing design out of all proportion to its guiding capacity. As a consequence the work



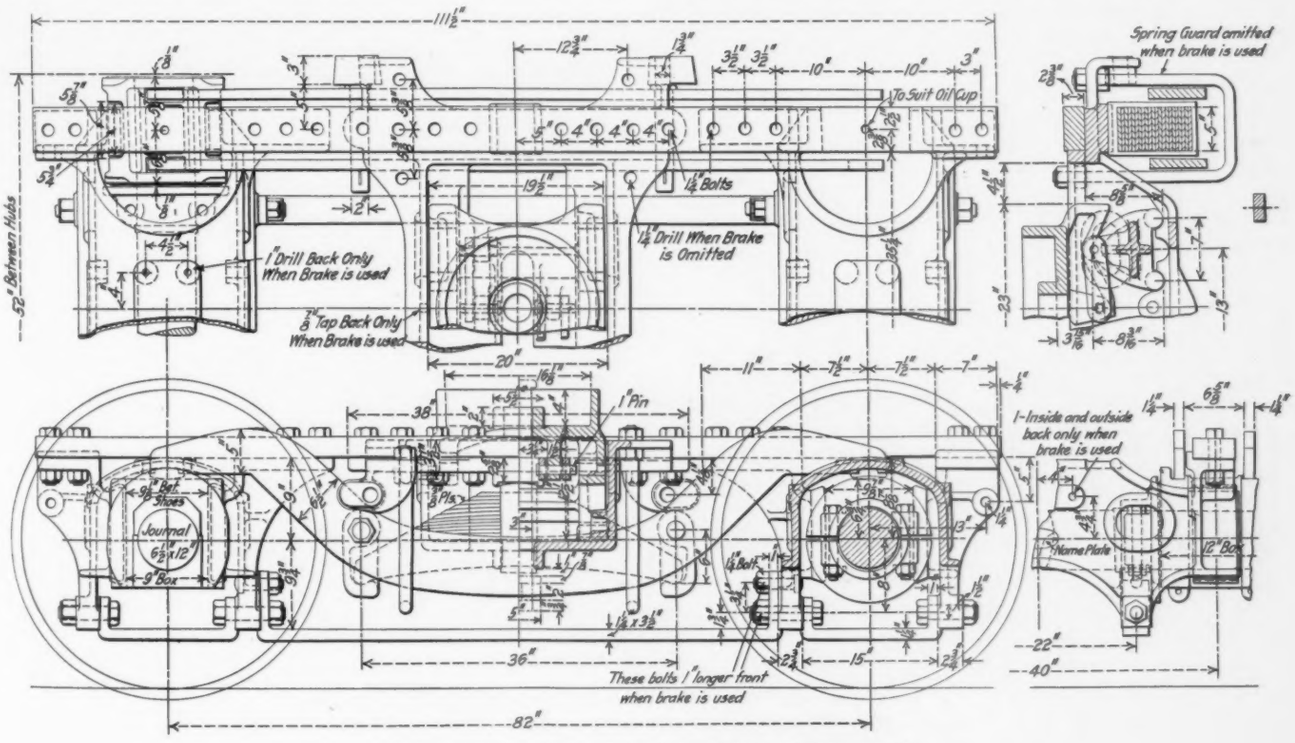
Rocker Used in the Engine Truck

which should devolve upon the truck consistent with the load carried at the centerpin has been, to a considerable extent, taken up by the leading drivers, resulting in lack of stability on tangents and excessive wear of the flanges of leading driving wheel tires.

These conditions have led to the development of a lateral motion bolster device for locomotive trucks which, it is claimed, will meet these exacting requirements more fully than the three point link suspension which heretofore has been almost universally used. In principle it provides a constant resistance regardless of the lateral displacement of the bolster instead of a low initial resistance increasing with the lateral displacement, as is obtained with the three point suspension links. Variations, such as high initial resistance, with a constant resistance following a predetermined bolster movement, can be obtained by slight modification of the surfaces in contact. One of the illustrations shows the heart shaped rocker in detail. The swing bolster bears directly on these rockers which are connected to it by links to insure their remaining in the proper position.



Engine Truck Designed to Provide Constant Resistance Regardless of the Lateral Displacement of the Bolster



Arrangement of the Constant Resistance Engine Truck

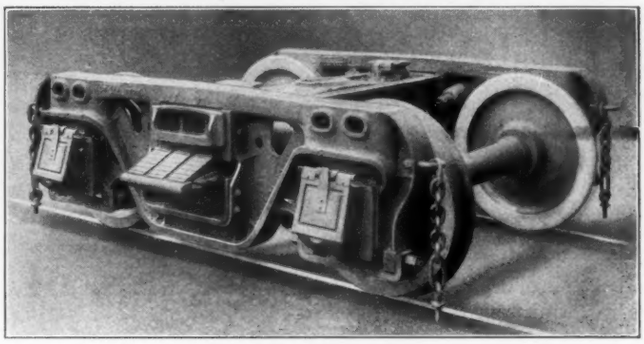
Service results with this truck show a marked reduction in the flange wear on leading drivers, a steadying action while running on straight track, an absence of jerky motion on curves and

withal a better riding engine under all track conditions. This bolster arrangement, on account of its doing more work in guiding the engine, requires a high duty truck frame. The design here shown eliminates the separate, bolted-on pedestals, combining the four pedestals at each end of the truck in a single cast steel transom with renewable shoes. The use of axle collars having been found desirable, this arrangement enables the cellars to be packed without removing the pedestal tie bars.

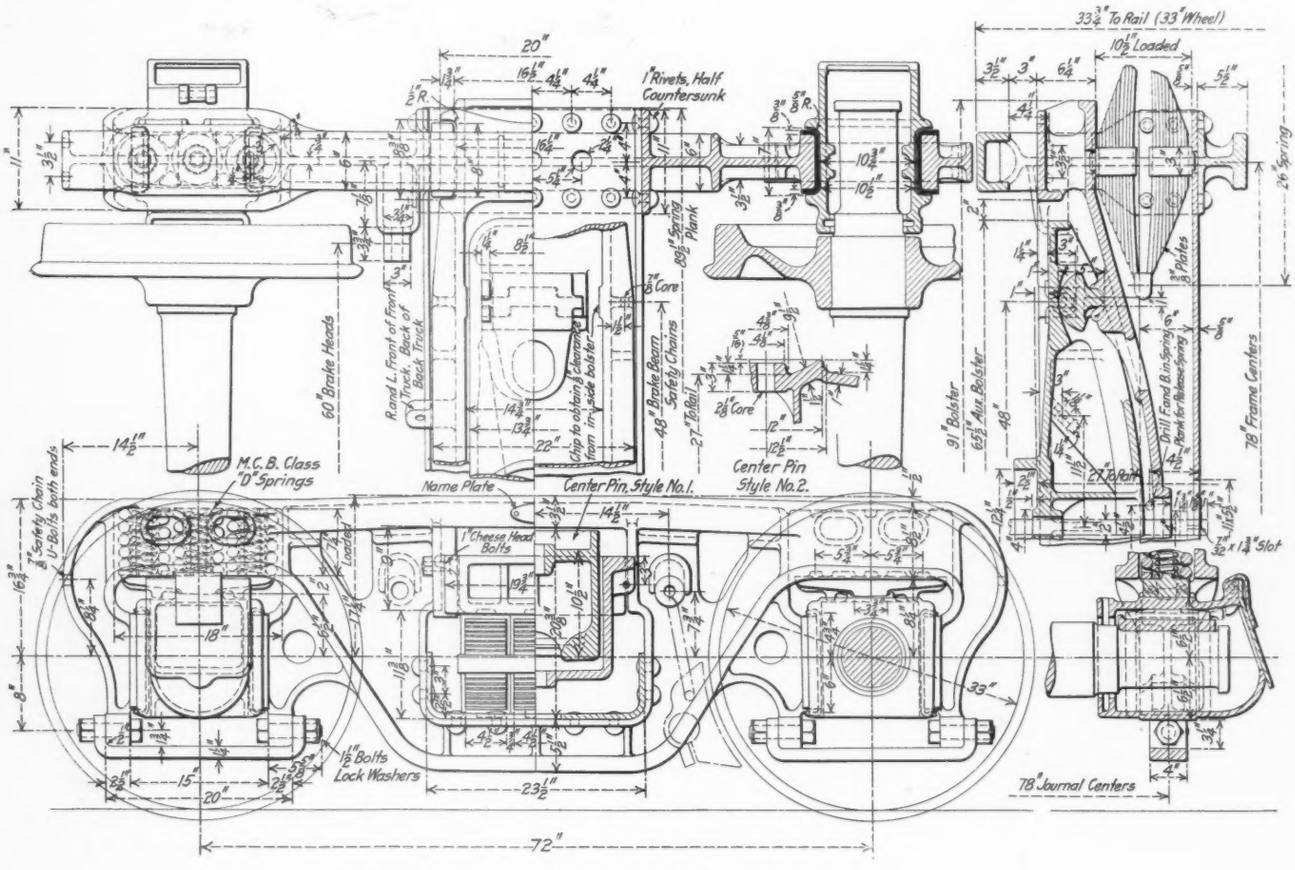
The aim in the design of the Economy tender truck, illustrations of which are also included, was to secure an easy riding truck having flexibility combined with the ability to remain square, in conjunction with either a lateral motion or rigid centering arrangement. Easy riding qualities have been obtained by the use of the pedestal type of frame with coil springs resting on an equalizer centrally located over each box, in combination with elliptic bolster springs. The coil springs arranged in the manner shown will accommodate any axle load that it is possible to utilize, with the idea of always providing surplus capacity to obviate breakage.

The spring plank arrangement provides for the flexibility that ordinarily obtains with the arch bar truck, permitting the truck to accommodate itself to uneven track conditions without causing undue stresses upon any of the coil springs, or unequal bearing pressures. The riveted connections between the truck frame and the spring plank are of such ample proportions, and the spring plank of so great a width as to insure the truck remaining square.

The bolster arrangement to provide for lateral motion consists of an auxiliary bolster located within the main bolster and resting upon three point rockers. The rocker bearing surfaces can be so arranged as to provide for a resistance curve identical with that obtained with the use of two point offset hangers. This arrangement eliminates the use of cross transoms. The curve of resistance can be changed by changing the contour of the bearing surfaces. If lateral motion arrangement is not desired a plain bolster can be substituted for the swing motion bolster without any alteration. It will be noted that few parts are used in providing for a pedestal type truck having a swing motion bolster. The side frames are designed to give ample lateral as well as vertical strength, and brake hanger bosses are arranged to use U shaped hangers, without offset.



Economy Tender Truck



Economy Tender Truck, Showing the Double Bolster Arrangement

Both these trucks are the product of the Economy Devices Corporation, 30 Church street, New York.

The Safety Movement.—While considering the safety-first movement, it might be as well to remember that other places besides the shop are not free from danger and the drafting room is one of these. Draftsmen should take special care when they have to go into the shop.—*American Machinist.*

PORTABLE STEAM STERILIZER

The accompanying illustration shows a portable steam boiler for sterilizing drinking water coolers in passenger cars as provided by law. It is sold by the West Disinfecting Company, 12 East Forty-second street, New York City. It consists essentially of a steam boiler of 10 gal. capacity, which is heated by a kerosene vapor flame from three Lovett Giant flash burners in a tank under the boiler. The boiler is well lagged with two thicknesses of asbestos, that next to the boiler being composed of soft fiber and that next to the jacket being asbestos mill board. The jacket extends below the boiler and forms the furnace within which the oil tank is placed.

The boiler is constructed of galvanized steel, the joints being welded by the oxy-acetylene process. It is built to stand a test of 200 lb. steam pressure, which gives an ample factor of safety for the working pressure of 40 lb. to 50 lb. The fuel tank is also built of galvanized steel in the same manner, to withstand a test pressure of 75 lb., the actual working pressure being about

Steam Sterilizer for Water Coolers

7 or 8 lb., which is secured by means of a hand pump incorporated in the construction of the tank.

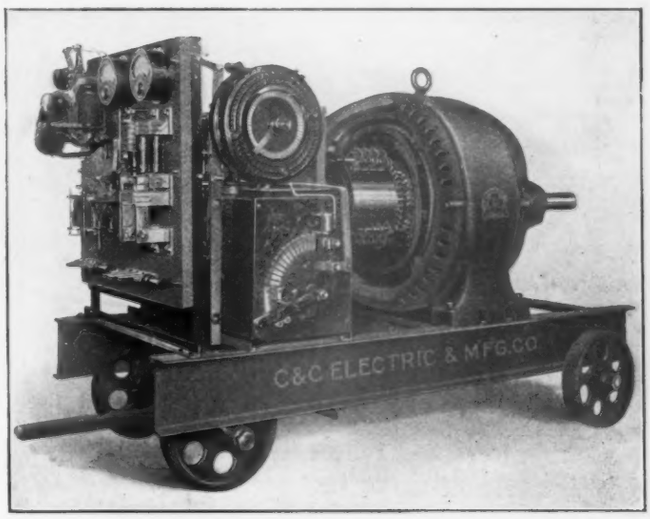
The device is mounted on wheels so that it may be easily moved from one car to another throughout the yard. The steam is taken from the top of the boiler and is discharged through a ⅛-in. outlet into the cooler, which is turned upside down over the outlet, as shown in the illustration. With this sterilizer one man has sterilized 157 coolers from 34 cars in eight hours, using 4 gal. of low grade kerosene costing approximately 5 cents per gallon, and 16 gal. of water. In this specific case the cost of labor for performing this work was $1.52. To do this work it was found necessary to refill the boiler four times, and to replenish the burner twice. The boiler is easily filled by simply removing the nozzle from the end of the discharge pipe, placing a water hose thereon. The water is then turned on and allowed to pass into the boiler in this manner, the top gage cock being opened to provide the necessary vent. In this way it is not necessary to draw all the steam off the boiler nor to extinguish the fire. When being filled in this manner only 15 min. is required to raise the pressure sufficiently high for operation. On starting up in the morning, however, 30 min. is required to bring the boiler up to a working pressure. Tests have shown that it is only necessary to sterilize the coolers by this method for one minute, very satisfactory results being obtained in this time.

While the number of coolers that can be handled by one man has been found to be about 160 per eight hours, it is believed that two men would be able to handle between 250 and 300 coolers in the same time if necessary. The roads using this system have found it more satisfactory than the yard steam line system. Dryer steam is obtained, and where these machines are in service the yard steam line has been discontinued entirely, thus eliminating the losses due to condensation. It is also estimated that this device will save from 25 to 30 per cent in the cost of labor for sterilizing the water coolers. Each sterilizer is provided with a steam gage, water glass, three gage cocks, washout plug and safety valve. The whole device weighs 325 lb. when loaded for operation.

PORTABLE ARC WELDER

A portable arc welder, having all the features of the larger stationary equipments, has been designed by the C. & C. Electric & Manufacturing Company, Garwood, N. J. The equipment is extremely flexible for welding and repair work in ship yards, machine shops, locomotive shops and foundries. The motor circuit may be connected to any available part of the shop or yard circuit.

The equipment, consisting of dynamotor, control apparatus and switchboard, is supported on a base of I-beams and mounted on a heavy iron truck. The welding current is generated by a 110-volt dynamotor, the generator end having a capacity of 200 amperes at 70 volts. The motor shaft is extended to receive a pulley for belt drive, when in use on barges, in shop yards or where electric current is not available. As illustrated, the starting box and field control rheostat are mounted on the frame structure supporting the switchboard. The switchboard carries



Complete Portable Equipment for Electric Welding

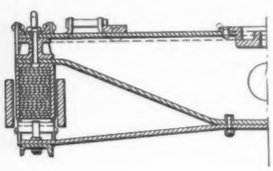
the main line switch and circuit breaker for the motor, and automatic control relays for two individual welding circuits. A set of 400 amperes will provide for one graphite electrode or two metallic electrodes for welding. The graphite electrode gives a temperature of about 4,000 deg. C., and is used for cutting, preheating and welding with an auxiliary bar. The metallic welding electrode furnishes the welding metal directly and can be

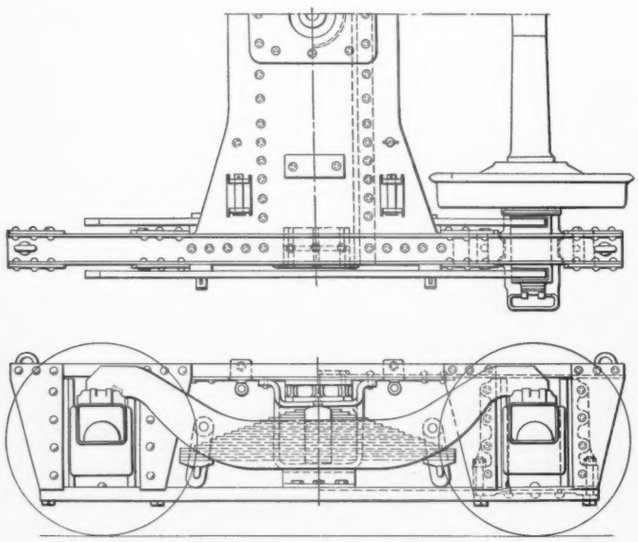
used on vertical or overhead work. The automatic relays in each welding circuit insert and cut out small steadying resistances on drawing the arc, and thereby prevent burning of the metal. Automatic devices also prevent interference between operators. An ammeter in the welding circuit permits the accurate adjustment of the current to the work.

STRUCTURAL STEEL TENDER TRUCK

A structural steel tender truck of the equalized pedestal type has recently been introduced by the Canadian Locomotive Company, Ltd., Kingston, Ont. The construction has been developed and patented by Messrs. Casey and Cavin, with the view to increasing strength and durability, and at the same time effecting a considerable reduction in weight.

Owing to the inherent tendency to internal strains and shrinkage cracks which exists in cast steel bolsters, much trouble has been experienced on many Canadian roads with the present type of equalized pedestal truck. In order to preserve an adequate factor of safety the bolster castings are necessarily much heavier than they would be if a more reliable material were used. The





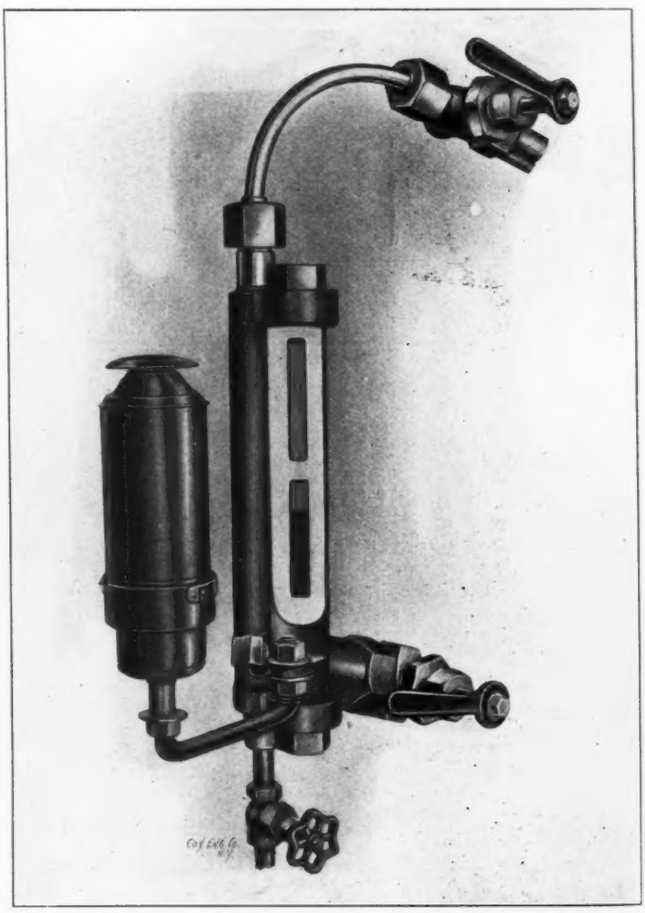
Structural Steel Pedestal Tender Truck

new truck is built up, with two exceptions, entirely of rolled sections in which the strength of the material is uniform and definitely known. The bolster is of pressed steel flanged with a deep section at the center and decreasing in depth toward the ends. It has a large cover plate hydraulically riveted to the flanges at the top. The ends of this plate, which are secured to the side frames are considerably wider than the bolster, thus forming a strong diagonal bracing for the whole truck structure. Apertures are provided in the cover plate for the center casting and brake hangers. The hangers are supported from lugs punched and bent from the cover plate and forming an integral part of it. Both the top and bottom rails of the side frames are of channel sections and are connected by plates which form the pedestals for the journal box. The ends of the bolster at the spring seat are stiffened by light cast steel fillers inserted between the bolster and cover plate.

Owing to the limited space between the spring and equalizers a drop forged T-head hanger has been substituted for the usual type of U-hanger used on this type of spring suspension. These hangers extend through slots in the ends of the springs and are held in position by gibs in the manner commonly used in driving spring suspension. The saving in weight effected by this construction is claimed to be about 1,500 lb. per truck, making a total of 3,000 lb. reduction in dead weight per tender.

REFLEX WATER GAGE WITH METAL ENCASED GLASS

A reflex water gage, the glass of which is contained in a soft metal casing, sealing the edges against the action of steam and water, has been developed by the Prince-Groff Company, 50 Church street, New York. It is called the "Pressurlokd" and, as shown in the illustration, the design includes the lamp and all fittings by which it is attached to the boiler. The frame, which is a one-piece steel casting, contains two chambers, running parallel to each other, which are connected by ports at the top and bottom. The registering column contains the sight glass and communicates directly with the boiler through the water connection, which enters the well at the lower end of the column. The auxiliary

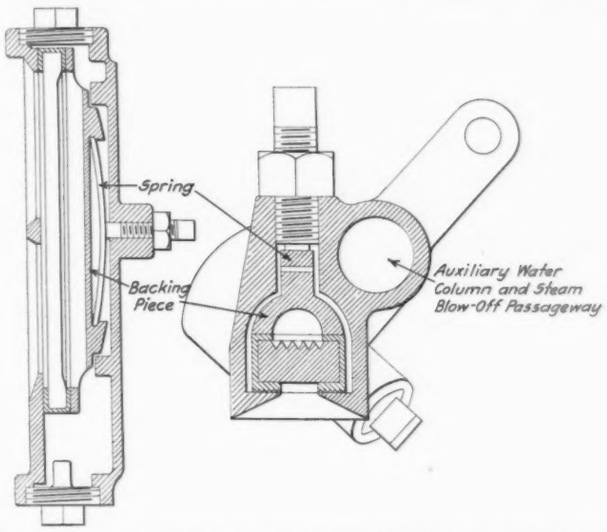


Reflex Water Gage with Metal Encased Glass

column receives the steam connection, thus protecting the reflex surfaces of the glass from erosion when steam is blown through the gage. Large plugs seating against copper gaskets close the top and bottom of the registering column.

The reflex glass is held in place by means of a backing piece bearing against the soft metal casing on the back face of the glass. Horizontal and vertical sections through the backing piece are shown in the engraving. Pressure is exerted against the backing piece by a single set screw acting against a heavy single leaf spring, thus insuring a uniform bearing

pressure at all points between the backing piece and the glass, as well as between the glass and the frame. The joint between the glass and the frame is sealed by the soft metal casing which forms a gasket unaffected by steam or hot water. The joint between the backing piece and the glass is sealed in the same manner and all portions of the glass



Sections Through Registering Column of "Pressurlokd" Water Glass

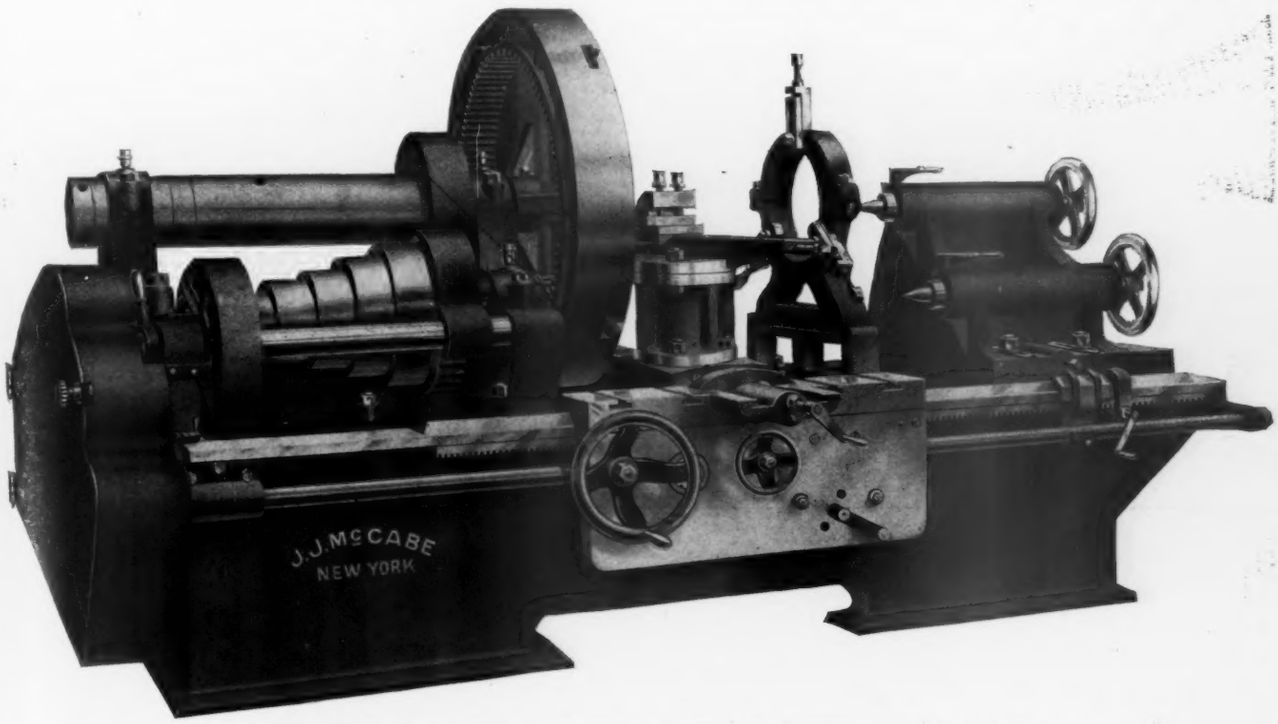
except the reflex surfaces are entirely free from contact with steam or water. It is claimed that by this construction should the glass be cracked or broken into several pieces the external pressure against the metal casing around the edge of the glass locks the pieces together so that it is impossible for them to be blown out of the frame. Glasses which have broken in service are said to have been held in place in this manner while the engine completed its trip without the necessity of cutting out the gage. Access for water and steam to the back of the glass is secured by means of passages through the backing piece shown in the longitudinal section.

The boiler fittings are designed for uniform strength throughout. All joints are sealed by means of copper gaskets. Plug cocks are used, thus providing straight passages which are easily kept clean. Owing to the fact that pressure on the metal casing holds the glass in position when it is broken, it has not been considered necessary to restrict the size of passages to meet the requirements of safety. In order to reduce to a minimum the probability of false indications from plugged passages 9/16 in. openings have been provided throughout. The auxiliary water column provides the additional steadying capacity required by the larger size boiler connections. A cleaning plug is provided in the frame directly opposite the water connection at the bottom of the registering column. A special tool has been designed for insertion in place of the plug, by means of which the passageway may be cleaned while the boiler is under pressure. The glasses are readily renewed by removing the cap at either the top or bottom of the frame.

DOUBLE SPINDLE LATHE

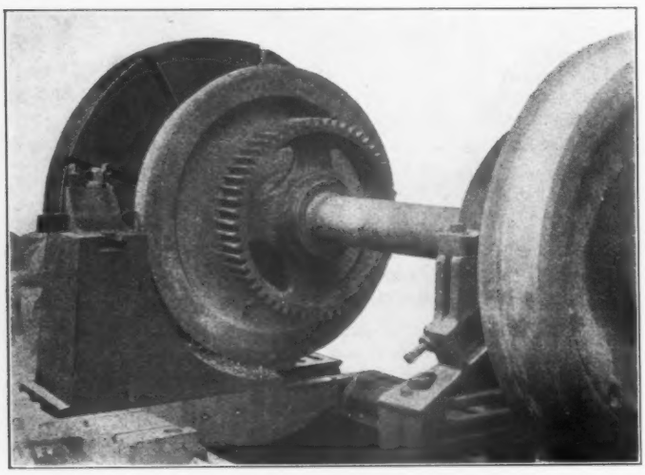
For a number of years a double spindle lathe has been built by J. J. McCabe, 30 Church street, New York, which has met with considerable favor in roundhouses and small railway repair shops. This machine has been recently redesigned to meet the requirements of modern high speed tool steel and a number of features especially adapted for service in railway shops have been included in the new design.

The new lathe has a 48 in. triple geared spindle for large work and a 26 in. back geared spindle for general use on small work. The spindle of the upper swing has been enlarged considerably and by the use of the internally geared face plate a ratio of gearing of 72 to 1 has been obtained. It is claimed that ample power has thus been obtained to fully meet the requirements of tire turning with modern tool steel. The back gear for the lower spindle has been located on the front of the machine, thus tend-



Double Spindle Lathe, Showing Geared Face Plate in Position on Upper Spindle

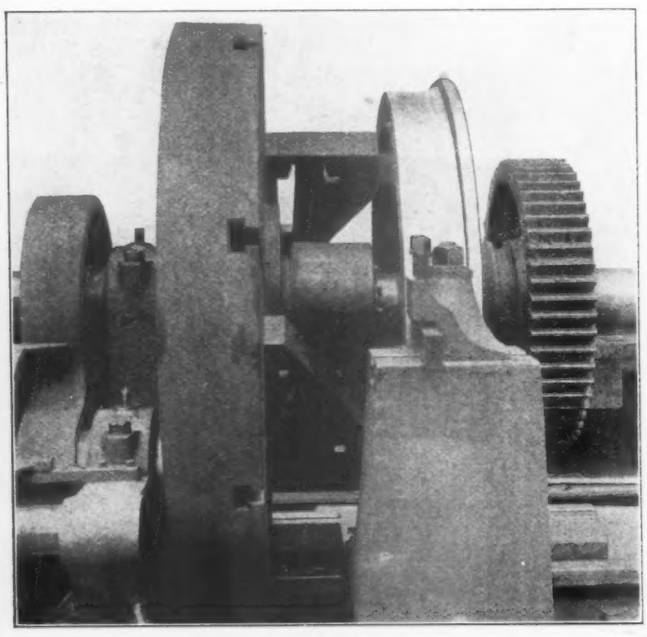
ing to throw the strain on the spindle downward instead of in an upward direction as is the case where the back gears are located at the rear of the head. The bed has been widened and much increased in rigidity by extending it to the floor. To facilitate the turning of wheels a special wheel holding attachment has been designed, consisting of two driver arms and a socket plate



Special Tool Rest for Turning Wheels and Tires

attached to the face plate of the upper spindle. The wheel is centered by means of a three piece conical bushing which surrounds the journal. The outside conical surface of this bushing fits a corresponding inside surface in the socket plate, thus wedging the bushing against the journal and securely holding it against the pressure of the tool.

The swing may be increased to 54 in. or 60 in. by means of



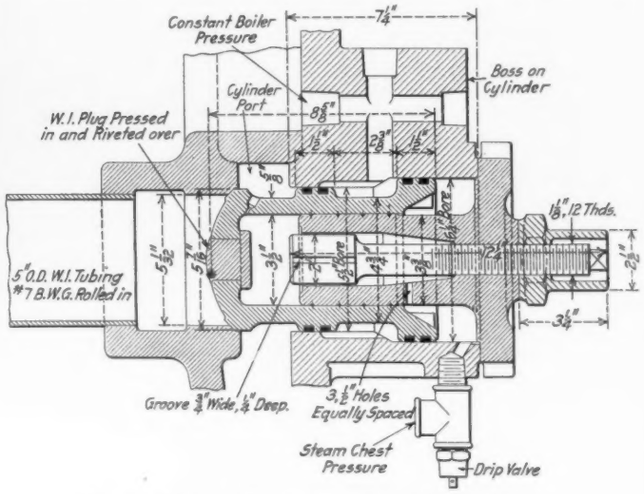
Socket Plate and Driver Arms for Centering and Driving Mounted Wheels with Outside Journals

specially designed raising blocks which can be placed under the head and tailstock of the machine when it is desired for use in turning small driving wheels. In order that the crank pin may clear the face plate, the lathe center is placed in a socket plate attached to the center of the face plate, which extends the center a sufficient distance from the face plate to allow the crank pin to clear. A heavy tool rest has been designed for wheel and tire turning. As shown in one of the illustrations, it consists of a rigid block having a long cross bearing on the lathe carriage, curved to clear the wheel.

These machines are built in a standard size for stock, all parts being interchangeable. It is possible, therefore, to turn them out at a moderate cost. The beds are furnished 16 ft. in length and will turn 10 ft. between centers. If desired, however, beds of any length can be furnished.

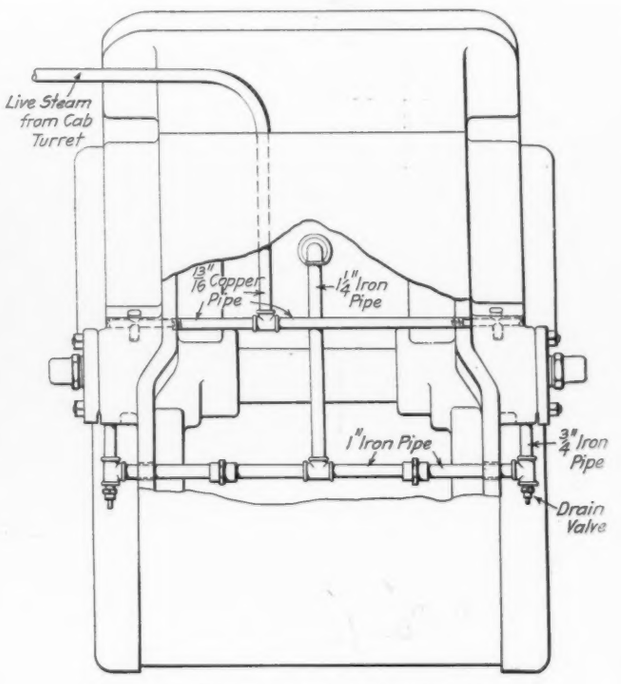
LOCOMOTIVE BY-PASS DRIFTING VALVE

A locomotive by-pass valve so arranged that during periods of drifting a small supply of live steam from the boiler is automatically fed to the cylinders has been developed on the



Section Through By-pass Drifting Valve Chamber

Delaware, Lackawanna & Western and was recently patented by H. C. Manchester, superintendent of motive power and equipment, and S. S. Riegel, mechanical engineer. These



Steam Connections to By-pass Drifting Valves

valves are of the piston type, operating in chambers opening into the ports between the valve chamber and cylinder. The two chambers at the opposite ends of each cylinder are con-

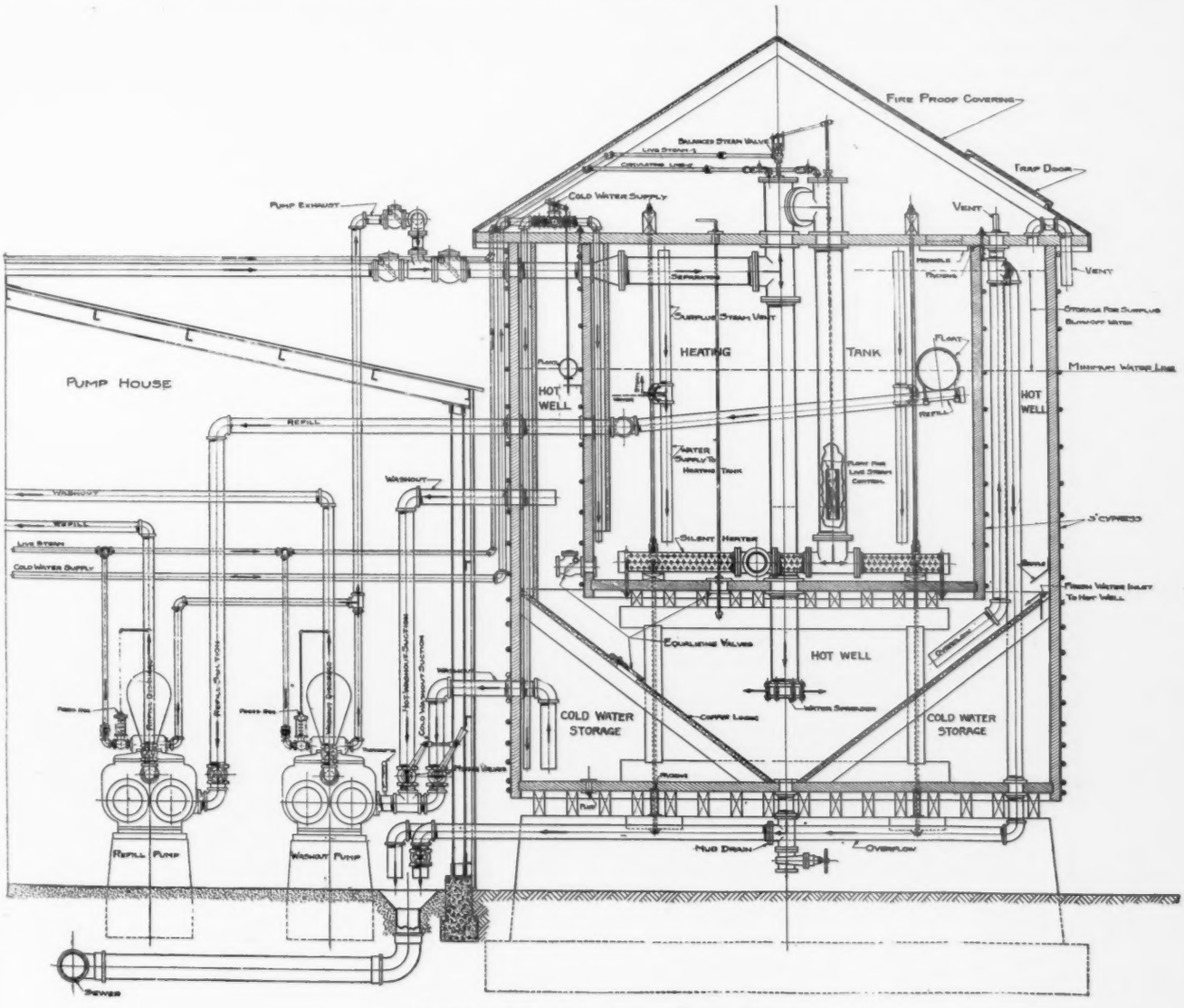
nected by a 5 in. wrought iron tube which forms the by-pass connection when the engine is drifting.

The operation of the valve may be followed by referring to the drawing showing a sectional view through the valve and its chamber. The valve, which is in the form of a hollow cylinder, is guided by a cylindrical extension on the valve chamber cap. It closes the by-pass at its inner end. An annular chamber surrounding the value near its outer end is formed by two sets of packing rings, the outer set operating in a chamber 6¼ in. in diameter, while the inner set is 5½ in. in diameter. A 13/16 in. copper pipe leading from the cab turret provides a constant supply of live steam to this chamber. The space between the valve cap and the outer end of the valve is at all times in communication with the live steam cavity of the valve chamber. When the throttle is open the pressure in this chamber acting against the entire area of the valve holds it in the position shown in the drawing. When the throttle is closed this pressure is relieved and the live steam pressure in the annular cavity, acting against an effective area equal to the difference in area of the two pistons, forces the valve open. In doing this the inner piston overtravels six grooves leading from the annular chamber, thus allowing live steam to enter the cylinder. The construction of the valve is such that its operation in opening and closing should not be accompanied by a serious shock. The length of stroke is adjusted by means of a rod threaded through the center of the head.

Engines equipped with these valves are claimed to be very easy coasters. Sufficient live steam is furnished to break up the vacuum during coasting periods, and the use of live steam tends to prevent chilling of the cylinder walls. By preventing the inrush of air, carbonization of the oil in the cylinders is eliminated, a matter of importance on superheater locomotives. These valves are claimed to have effected a great increase in the life of cylinder and piston rod packing.

GRAVITY BOILER WASHING SYSTEM

The purpose of all hot water locomotive boiler washing systems is to reclaim the greatest possible amount of heat from the blow-off in order that hot water for washing and filling may be obtained with a minimum expenditure of live steam. In the Winters gravity system of locomotive boiler washing the material used in the construction of the plant has been chosen and the tanks have been arranged with especial attention to the conservation of heat. This system, which is being placed on the market by the George M. Newhall Engineering Company, Philadelphia, Pa., is shown in the accompanying engraving.



Hot Water Boiler Washing and Filling Plant

The plant consists of two standard 3 in. cypress tanks, one

submerged within the other. The outside tank forms the hot well into which the locomotives are blown off, the inside tank containing water for refilling. The hot well is equipped with a copper lined hopper bottom which guides the mud deposited from the blow-off water to a central opening leading to the mud drain. The tank below the hopper bottom forms a cold water storage, the supply for which is controlled by a float operated valve. Both tanks are tightly closed at the top, the only communication with the atmosphere being through the vent in the top of the hot well. A separator is located within the refilling tank. It consists of an inverted U composed of two large vertical pipes of unequal length; the longer pipe extends through the bottom of the refilling tank into the lower part of the hot well while the shorter pipe connects with a silent heater located in the bottom of the refilling tank.

When a boiler is to be washed out the blow-off cock is attached to the blow-off line in the roundhouse and the boiler blown down in the usual manner. The water and steam from the locomotive enter the hot well side of the separator near the top of the refilling tank. The water flows by gravity into the hot well, while the steam accumulates in the separator forcing the water down in both pipes until an outlet is secured through the heater. When the water in the heating or refilling tank reaches the boiling temperature steam will no longer be condensed, but will pass up through the water and accumulate in the top of the tank until an outlet has been forced to the hot well through the surplus steam vents. No steam can be discharged to the atmosphere until the water in the upper portion of the hot well has reached the boiling temperature.

Starting with the cold water supply it will be noted that fresh water for the hot well is drawn from the warmest portion of the cold water storage and that the water supply for the heating tank is drawn from the upper part of the hot well where the cleanest and warmest water is located. The inlet to the refilling suction is attached to a float so that the hottest water in the plant is used for refilling purposes.

In designing these tanks a water capacity of 5,000 gal. is provided for each locomotive washed in 24 hours in order that the plant may have ample capacity to take care of unusual sequence in the operation of blowing down, washing out and refilling. In effect it assures a 24-hour supply of hot water for washing out and refilling before any blow-off steam can be wasted at the vent. Sufficient capacity is provided above the minimum water level so that the plant may receive the blow-off from a number of engines before there is any loss of heat at the overflow, which draws from the lower part of the hot well. In order that the temperature of the heating tank may be maintained at all times the separator is provided with a live steam connection. Steam admission is controlled by a float operated valve, the float for which is located in the heater side of the separator.

A 30-day test has recently been completed by the Central Railroad of New Jersey on a Winters plant installed at its Communipaw engine terminal at Jersey City. The guarantee under which this plant was installed requires that it maintain average refilling temperatures of not less than 180 deg., and average washout temperatures of not less than 130 deg. without the use of live steam, the blowing down pressures to average 125 lb. per sq. in. Exhaust steam is received from the washout and refilling pumps, but during the test the live steam connection was removed. The plant has a total water capacity of 60,000 gal., 30,000 gal. of which is in the hot well, 18,000 gal. in the refilling tank and 12,000 gal. in the cold water storage. The operating conditions are such at the Communipaw terminal that four or five engines may be blown down before any washing is done. The engines are then washed out and refilled before the plant receives any more hot water from the blow-off line. The following is a summary of the test results:

Total number of locomotives handled	169
Average boiler pressure at time of blowing down	91 lb.
Average temperature in the hot well at the washout suction	193 deg.
Average temperature at which locomotives were refilled	213⅔ deg.
Average time of blowing down (through 1¾ in. blowoff hose into 1½ in. iron conduit)	60 min.
Average time of washing out	42⅔ min.
Average time of filling	26 min.
Average time of firing up to 100 lb. gage pressure	52 min.

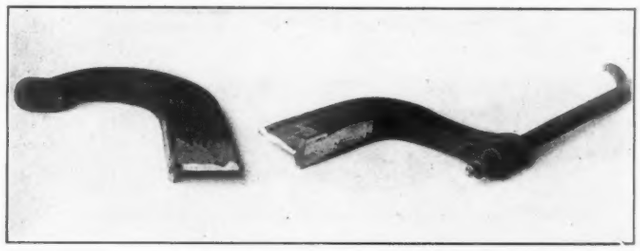
The wash-out pump suction has two branches, one from the hot well and one from the cold water storage, the temperature of the wash-out line being determined by means of a regulating valve easily adjusted to maintain any temperature required. The average time of firing up to 100 lb. gage pressure includes the time consumed in laying the fire which was also coincident with the time taken for refilling, these two operations being performed at the same time. The time required for the entire operation therefore averages 2 hr. 34 min. The comparatively long time taken for refilling may be accounted for by the fact that the pump was handling water boiling under two or three pounds pressure, the pump suction therefore receiving a mixture of hot water and steam. This is compensated for, however, by the speed with which steam is generated from water already at the boiling point.

The operation of the plant as described provides for the return of blow-off water to the refilling tank and thence to the boiler. In bad water districts where this practice would be inadvisable arrangements may be readily made to supply only clean water to the refilling tank. To do this the water supply connections between this tank and the hot well are removed leaving only the surplus steam vents, and cold water is fed to the refilling tank through an independent float valve installed for that purpose.

MALLEABLE IRON WELDED BY OXY-ACETYLENE

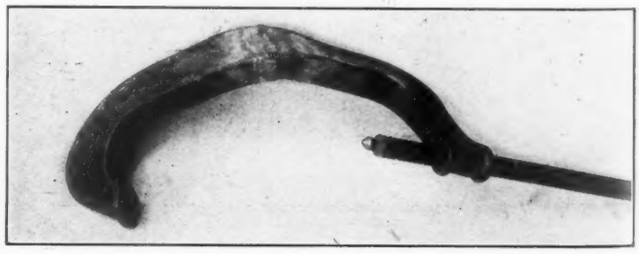
A method of welding malleable iron by the oxy-acetylene process has been perfected by the Vulcan Process Company, Minneapolis, Minn.

The accompanying illustrations show how a broken clamp was thus repaired. After being welded, the clamp is shown



Clamp Prepared for Welding

bent sidewise at an angle of 45 deg. with no rupture in the weld. In small objects the parts to be welded are beveled off on one side, the bevel extending clear across the break. The two parts are then heated to a bright red heat with the torch and the surface to be welded is sprinkled with the



Clamp Welded by Oxy-Acetylene and Bent 45 Deg. Without Rupture

Vulcan bronze flux, after which is added a small quantity of Tobin bronze melted from the stick by the oxy-acetylene torch. The action of the bronze determines whether the parts are hot enough for welding; if it readily adheres to the

surface of the iron the work is ready and the break should be filled in as quickly as possible. Care should be taken to keep the temperature as low as consistent to get a satisfactory weld. In larger work the fracture is V'd out on both sides and handled in a similar manner. Welds thus made have nearly the strength and ductility of the original metal.

CORRUGATED STEEL DOOR WITH FENDER ATTACHMENT

A corrugated steel box car door which is being manufactured by the American Car Roof Company, Chicago, is fitted with a fender attachment to prevent the doors being raked by wagons, etc., when the car is being loaded or unloaded.

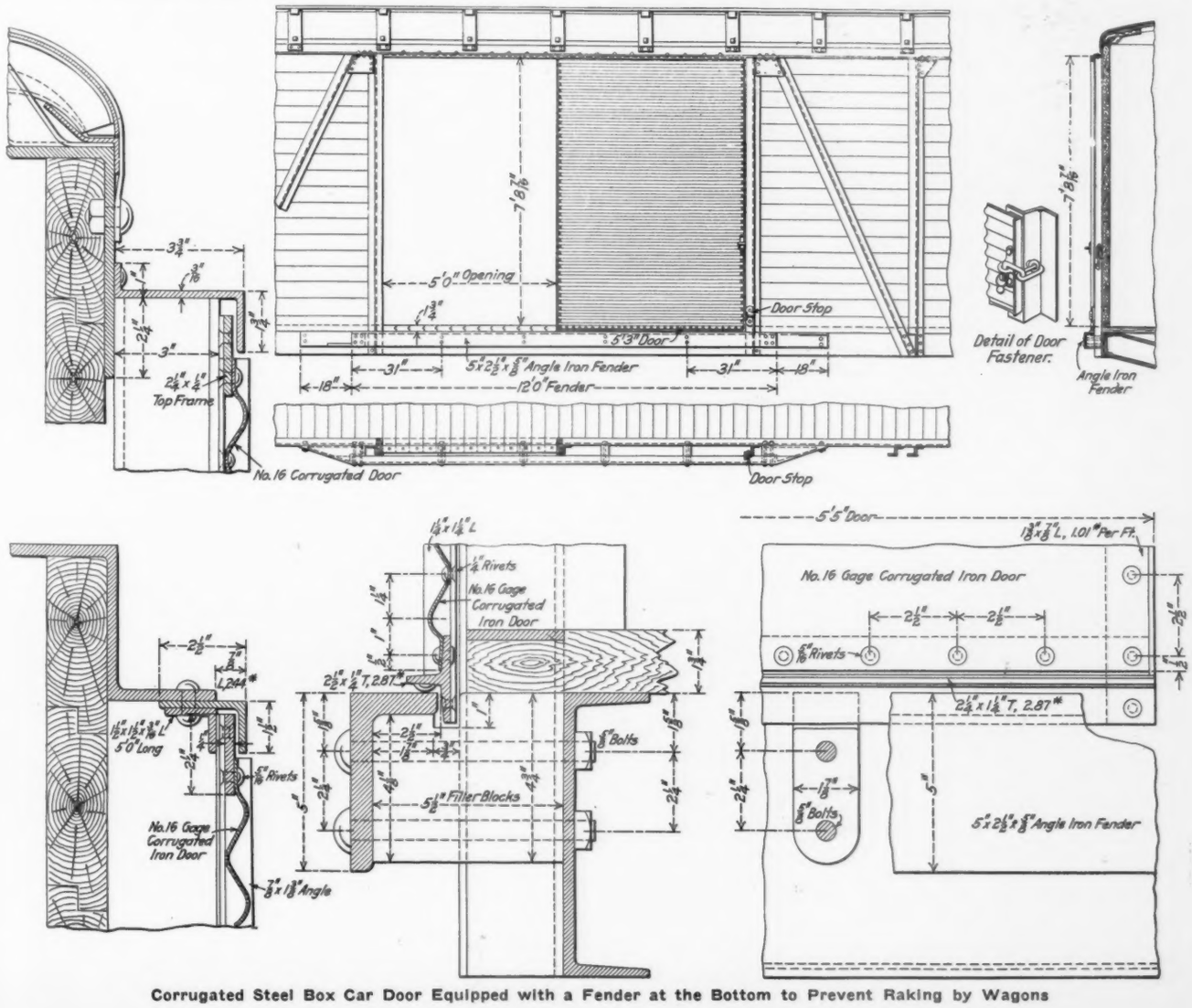
The fender consists of a 5 in. by 2½ in. angle held out from the side of the car by means of cast filler blocks; at the ends snub-nosed castings are used. When shut the front end of the door fits into an angle, the idea being to prevent it from bulging out in case freight should accidentally fall against it on the inside. It is securely fastened by a one link chain and hook in the rear which it is believed is sufficient to keep the rear edge of the door from bulging out. This door does not run on pulleys, but is supported at the bottom near each end by hard bearing points. It is claimed that in many instances after several months' service the pulleys which are commonly used for supporting car doors rust and stick. Further advantage in suspending the door on bearing points at the bottom is claimed, as when it is suspended from the top by means of pulleys, very few bolts or rivets can be employed to carry the weight of the door itself.

STAYBOLT CHUCK

The Christopher Murphy Company, Chicago, has recently placed on the market a square grip staybolt chuck as shown in

Square Grip Staybolt Chuck

the illustration. This chuck is used for screwing staybolts in the boiler and its chief advantage is that it is not necessary to put a



Corrugated Steel Box Car Door Equipped with a Fender at the Bottom to Prevent Raking by Wagons

square end on the staybolt for application. This chuck will grip the round iron by means of the dog inserted as shown in the engraving, and will turn either to the left or the right, gripping the iron harder the harder it is turned. By its use it will not be necessary to heat the staybolt in making the square for the head, and there will also be a considerable saving in metal as the staybolt need not be made as long. The dog is made of tool steel and is square, so that as one surface wears, another may be used, it being free to revolve on a pin in the chuck body, which is a drop forging. The chuck is provided with a No. 3 Morse taper and is made in sizes of ¾ in. to 1⅜ in.

MUDGE-PEERLESS VENTILATOR

The new Mudge-Peerless ventilator, which is made and sold by Mudge & Company, Chicago, is being applied on a large order for equipment now being built by the Pullman Company,

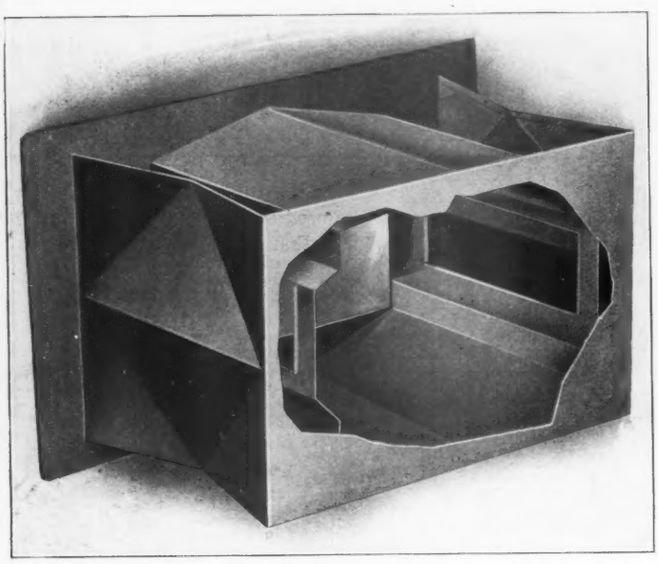


Fig. 1—Type 4 Mudge-Peerless Ventilator Showing Interior Arrangement

at Chicago. This ventilator, as shown in Fig. 1, is box-like in shape with the air ramming faces arranged transversely to the line of car travel. These faces are pressed in the form of a *V*

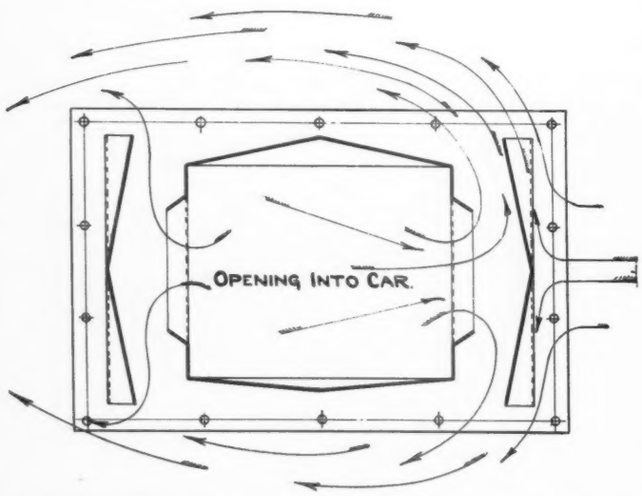


Fig. 2—Sectional View of the Mudge-Peerless Ventilator Showing the Action of the Air Currents

at each side of the center line and at right angles to the ventilator opening of the car, the *V* shaped surfaces being inclined toward the exhaust outlets from the interior. The purpose of this formation is to prevent the air displaced by the ventilator from escaping around the side of the monitor type roof or over the top of the arch type roof.

The sectional view, Fig. 2, shows the action of the outside air as it passes over and under the exhaust openings, drawing the vitiated air from the car body through the ventilator opening. The greater the velocity of the air passing over these openings the greater will be the efficiency of the venti-

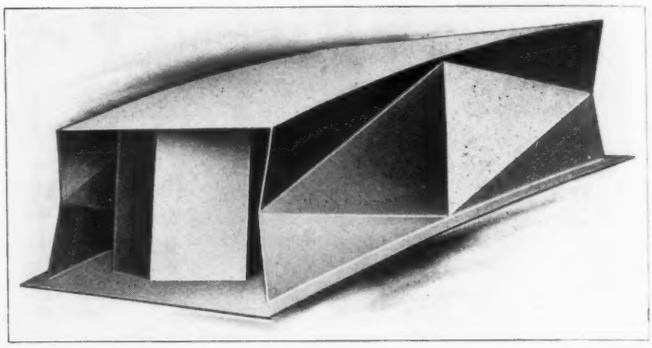


Fig. 3—Ventilator for Arch Type Roof

lator. On the arch or turtle back car roofs the operating principle is identical except that the vacuum pockets are formed at the exhaust opening on the sides of the ventilators. An illustration of the ventilator for these types of roofs is shown in Fig. 3. The interior construction of this ventilator is hexagonal in form, the rear end fitting tightly over the opening into the car while the front is solidly joined to the outside wall. Protecting exhaust outlets are provided for practically the full length on both sides directly behind the air ramming faces.

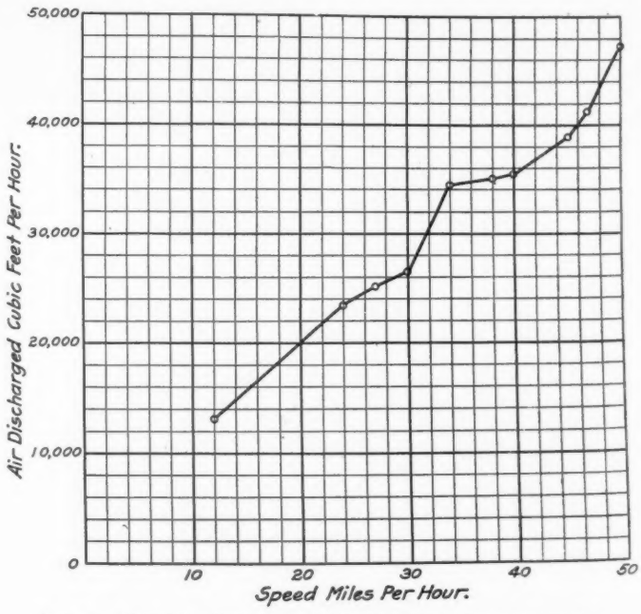


Fig. 4—Exhaust-Speed Curve of Mudge-Peerless Ventilator

The angular baffle plates which virtually form the roof prevent rain or other elements from dropping down into the interior, and the outside ventilator face prevents down drafts being caused by side winds. Two small openings are provided in the bottom plate to discharge the condensation in case the atmosphere contains a great deal of moisture.

The efficiency of this ventilator and the ratio of the exhaust to train speed is shown in Fig. 4. This chart was compiled from anemometer readings taken on a wooden frame car with

all doors and windows closed during the test. Tests have also shown a strong exhaust action with the trains standing, if side

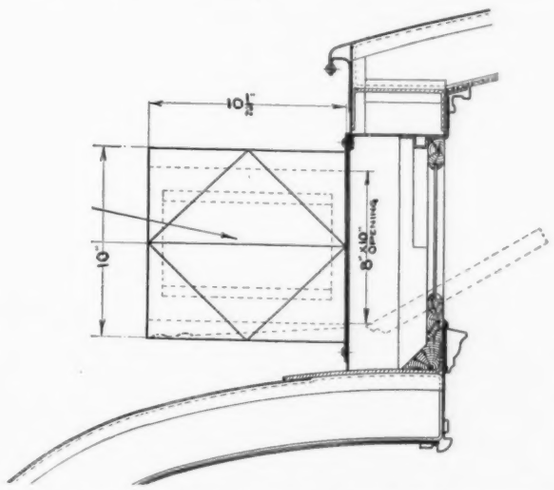


Fig. 5—Application of Ventilator to Monitor or Clerestory Roof

winds are blowing from any angle. With a side wind blowing at a velocity of 4.25 m. p. h., an exhaust of 3,600 cu. ft. per

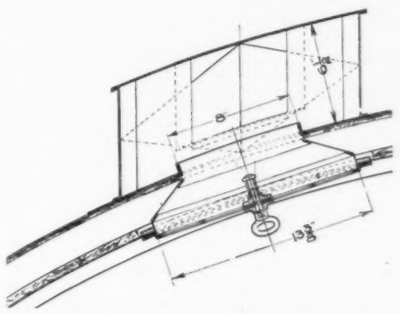


Fig. 6—Application of Ventilator to Arch Roof

hour was obtained and at 7.5 m. p. h., 6,480 cu. ft. was obtained, the same car being used as mentioned in the running test.

The application of the monitor roof type ventilator is shown

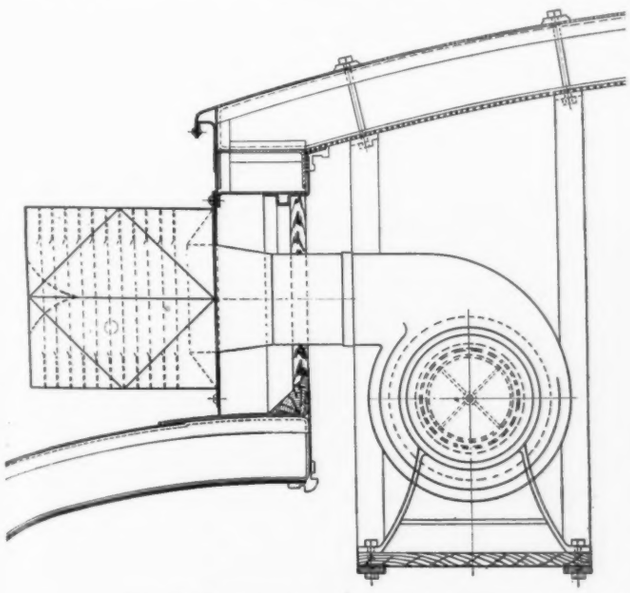


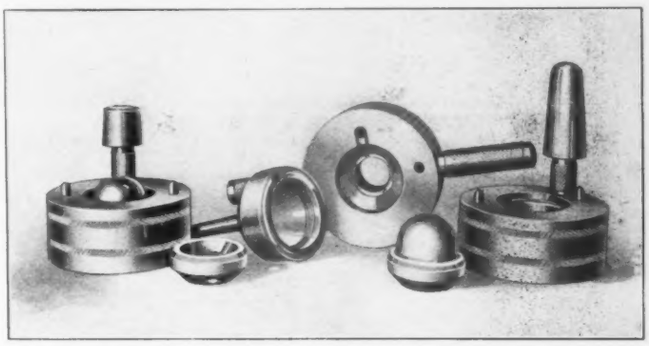
Fig. 7—Combined Ventilator and Blower

in Fig. 5. It is made in one standard size and design requiring no soldering or fitting, as it is simply bolted or screwed to the screen board. The standard deck sash behind the ventilator is then used for regulating the flow of air. The arch or elliptical roof type ventilator is shown in Fig. 6. It is applied in a different manner, since it is made to conform to the curvature of the roof. A 1½ in. flange is provided for soldering it to the roof sheets to insure water tight connections. Ventilation with this type of ventilator is controlled individually by operating registers applied to the headlining beneath each ventilator.

Fig. 7 shows the application of this ventilator in conjunction with an electric blower making a complete combination for the ventilation of dining cars which require the expulsion of fumes, smoke and kitchen odors while the car is standing. This type is provided with louvres as shown by the dotted lines. Its outside application to the screen board in the monitor roof car is the same as the type previously described. Simplicity has been carefully sought in both the construction and application of these various types of ventilators with a view to reducing the first cost and cost of maintenance.

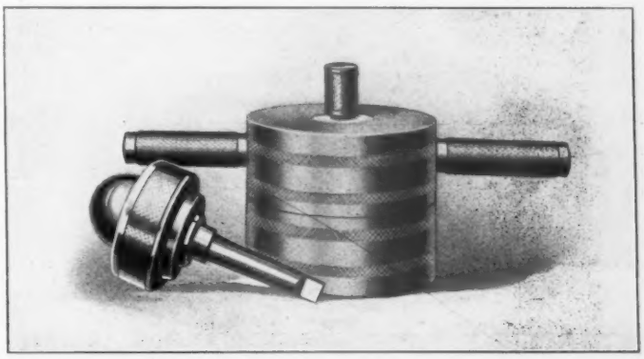
SOFT METAL GRINDERS FOR SUPERHEATER UNIT CONNECTIONS

A soft metal process of grinding ball joints has been developed by the Locomotive Superheater Company, 30 Church street, New York, for use in maintaining the joints between



Mould Complete with Chuck and Grinders

superheater elements and the header. The importance of maintaining the correct radius of the two parts of these joints is apparent. It has been found that grinders made of cast iron or steel are frequently continued in use after they have



Mould Assembled for Casting the Grinding Sphere and Chuck with Grinder in Position

lost the proper shape because of the lack of tools or facilities for truing them up. The development of the soft metal process has provided a means by which grinders can be quickly and cheaply renewed as often as is necessary, without the service of skilled labor or machine tools.

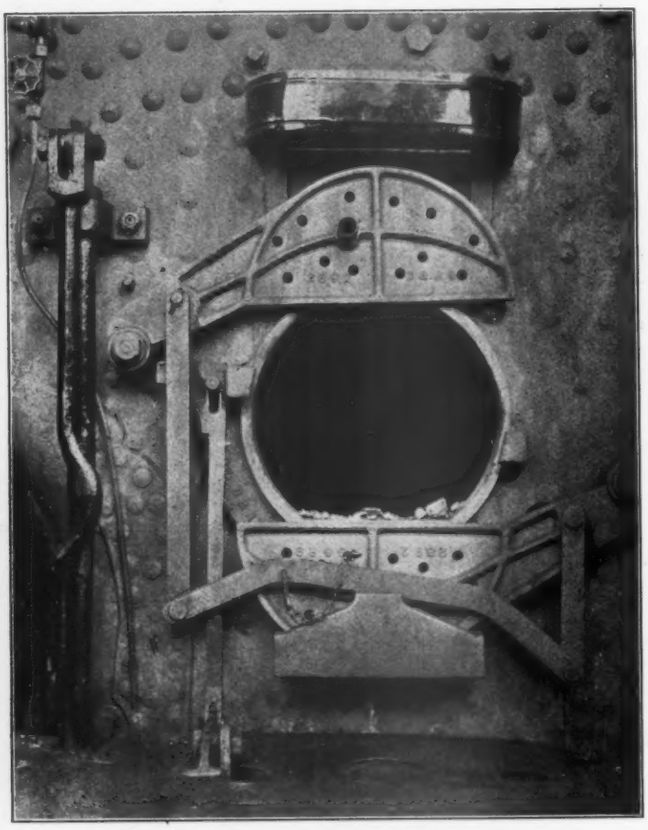
Grinding cups for the ball ends of the units and grinding

spheres for the seats in the header are made of lead or hard babbitt metal by casting in moulds which insure uniformity and correctness of the contour. A mould consists of three parts, a base in which the cup grinder is cast, a base in which the spherical grinder is cast and the top part of the mould which is used with either base. A chuck is provided which will hold either the cup or the spherical grinder and which has a shank suitable for use in an air motor or hand brace. When the grinders lose their contour they may be melted and remoulded with no waste of material. The chucks and the mould are furnished by the Locomotive Superheater Company.

GRAVITY FIRE DOOR

A foot operated locomotive fire door, the two halves of which are so arranged as to counterbalance each other, thus making unnecessary the employment of a power cylinder, has been developed and patented by P. C. Withrow, mechanical engineer of the Denver & Rio Grande.

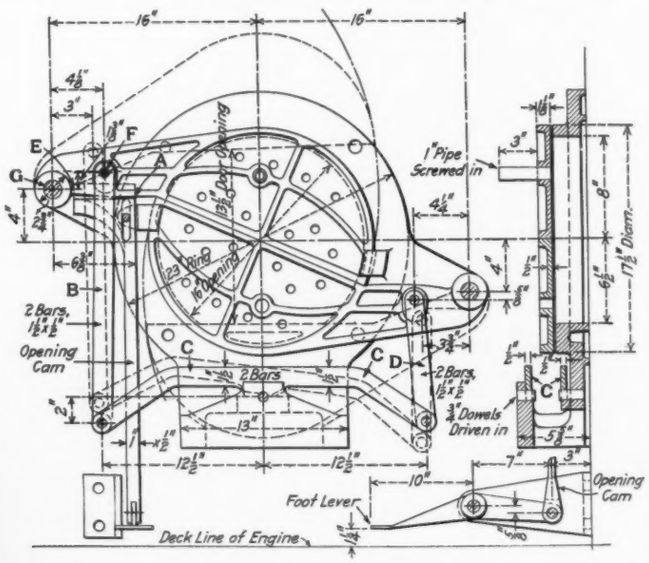
As shown in the engraving the door is in two sections, the upper part being pivoted at the left and the lower part at the right. It is opened by means of a foot lever located at the left and 20 in. out from the back head. This lever operates the door opening cam, which has a specially formed shoe at its upper end bearing against the under side of the upper door at *A*.



Gravity Fire Door Locked in Open Position

As pressure on the foot lever opens the door the point of contact between the cam and the door shifts from *A* to *E*. This gives a comparatively large leverage by means of which to start the door without unnecessary effort, and the decreasing leverage as the movement progresses keeps the travel of the foot pedal within reasonable limits.

The upper and lower sections of the door are connected by means of rods *B* and *D* and equalizer *C*. The pin *F* which connects rod *B* to the upper door is located above the hinge pin *G*, thus causing it to swing in closer to the vertical line through the hinge pin as the door is opened. The leverage of the upper door, the weight of which causes the closing movement, is thus increased. It will be noted that the pin which secures rod *D* to the lower section of the door is located at a point much nearer the horizontal center line through the hinge pin than is pin *F* in the upper door. The increase in leverage of the lower door in the open position is therefore less than that of the upper door. A further increase in leverage of the upper section is effected by the rolling contact between equalizer *C* and the door



Simple Gravity Fire Door

frame at the right of the equalizer fulcrum pin. This causes the fulcrum to gradually travel to the right as the door is opened. The upper door thus has sufficient overbalance to insure prompt closing on releasing the pressure from the foot lever. As the closing movement proceeds the various points return to a normal position, thus destroying the overbalance, and the closing is completed without slamming. The foot lever bracket may be fastened either to the back head or the deck as is most convenient.

This device has been in use experimentally on the Denver & Rio Grande for about two years, where it has been meeting with considerable favor. It is claimed that prompt opening of the door is effected without extraordinary effort; sufficient force is brought to bear upon the pedal by the natural swinging of the weight to the left foot as the fireman swings the shovel toward the fire door.

HAND SAW FOR CUTTING METAL

A metal cutting saw having a blade of the form usual for wood hand saws has been brought out by Henry Disston & Sons, Philadelphia, Pa. This saw has a special high temper suitable for metal cutting and is hollow ground for clearance. For cutting iron and steel it is regularly made with 12 points to the inch; for copper and brass with 10 points.

To get best results from a hack saw of the usual form, it is necessary to use both hands, one to push the saw and the other to guide it. The depth of cut is also limited to the inside depth of the frame. With the wide blade saw it is possible to cut to any depth. As with the wood hand saw, it is only necessary to use one hand in operating, which is advantageous under certain conditions.

PANAMA CANAL TRANSFERRED.—A railway paper published in India states that the following recently appeared in an Indian examination paper. "The Panama Canal is being cut from Delhi to Bombay in order to facilitate the speedy passage home of persons going on short leave from the new capital of India."

NEWS DEPARTMENT

In connection with the buy-a-bale-of-cotton movement which has been discussed in the newspapers, the Nashville, Chattanooga & St. Louis has announced that it will buy 125 bales of cotton at 10 cents a pound.

On September 1 the Illinois Central acquired from the Central Fruit Despatch, a subsidiary company, all its refrigerator cars and such cars not already lettered "I. C. R. R." will be relettered, to be operated hereafter by the railroad company direct.

The railroad companies have formally accepted the city ordinance governing the project for a new $65,000,000 union station and yards in Chicago to be used by the Pennsylvania, the Burlington and other roads, and to be completed within five years. In return for closing certain streets and alleys the city will receive $825,805 from the Union Depot Company.

The diary of a certain general superintendent shows that in one year he spent 101 days conferring with railroad commissions, committees of organized employees, city and town officers and officers of the courts; he was traveling over the road 155 days and spent 109 days at headquarters transacting business connected with the administration of the railroad.

On Tuesday, September 15, the Henry M. Flagler, the car-ferry which was built for the Florida East Coast for service between Key West and Cuba, was launched at the Cramp ship yards at Philadelphia. The ferry is built to accommodate 30 freight cars. It is 351 ft. long with 57-ft. beam. Its speed when loaded with 2,300 tons will be, it is estimated, about 12 knots.

The creosoting plant of the Missouri, Kansas & Texas at West Denison, Tex., has suspended operations because of a shortage of creosote oil. Large quantities of timber and ties are on hand ready to be treated, but the company's sources of supply have been Germany and England, and both of these are now cut off. The Pennsylvania Railroad has on hand a supply of creosote sufficient for the needs of its timber preserving plant for a considerable time to come.

The safety department of the Delaware, Lackawanna & Western, in Safety First Bulletin No. 8, gives the number of deaths and injuries to employees during the first half of each year since 1910—1911, 1912, 1913 and 1914—showing a decrease each year. The number of killed was reduced from 34 in 1911 to 7 in 1914, and the number of injuries from 137 to 99. The bulletin gives the causes of the deaths of the seven men in 1914, and contains a large number of suggestions for improving the safety record; also a long list of commendable actions of employees shown on discipline bulletins for four months of this year.

Figures recently compiled show that the number of stockholders of the New York, New Haven & Hartford is rapidly increasing under the management of Chairman Elliott. While the average increase from 1901 to 1912 was 1,194, the increase from 1912 to 1913 was 1,162, and from June 30, 1913, to August 31, 1914, was 2,305. The totals, with the number of women stockholders, about 43 per cent, are as follows:

	Total	Women
June 30, 1901	9,667	.....
June 30, 1906	12,627	.....
June 30, 1912	22,806	9,710
June 30, 1913	23,968	10,474
August 31, 1914	26,373	11,184

The New York, New Haven & Hartford reports that its plan for reducing the number of forest fires on Cape Cod by clearing wide strips along its right of way has met with marked success. This year from May to August inclusive there were only eleven fires attributable to sparks from locomotives and the territory burned over amounted to not more than 6¼ acres. In the same period last year there were 150 forest fires which burned over an area estimated at about 2,000 acres. Through all the wooded parts of Barnstable county a strip varying in width from 60 ft. to 130 ft. has been cleared on either side of the railroad's right of way. Pine trees have been left standing in these strips, as their leaves act as a screen. The areas cleared will be kept in that condition by the section gangs.

Thomas Cooper, land commissioner and assistant to the president of the Northern Pacific, has issued a statement announcing that during the last fiscal year the road has sold 800,000 acres of land, chiefly in Washington and Montana. A large area of eastern Washington land, suitable now only for grazing, brought 75 cents to $2.50 per acre. The company estimates the total land grant from Lake Superior to Puget Sound at 40,000,000 acres. The total sales to June 30, last, approximated 30,000,000 acres. Of the 10,000,000 acres remaining about half is still unsurveyed and unpatented. These figures were made public to refute many incorrect statements made during political campaigns, in which it has been alleged that the railway delayed federal surveying of its land to escape taxation. Mr. Cooper says that for 10 years the company has urged the government to hasten surveys, thereby enabling the company to sell its land and push development of its tributary country. The company has applied for a survey of practically all of the 5,000,000 acres still unsurveyed.

At the regular monthly meeting of the board of directors of the New York, New Haven & Hartford, held in New York on September 17, the officers were authorized by the board to purchase power from the New York Edison Company. This purchased power, together with that now obtained from the power plant of the New York Central and that of the New Haven at Cos Cob, will enable the road to increase the number of trains operated electrically between New York and New Haven from 37 per cent to 70 per cent of the total. In order to have 100 per cent of electrical operation it will be necessary to purchase additional electrical equipment and additional power for the eastern section of the electric zone between New York and New Haven. At the present time all of the important passenger trains and a number of the important freight trains running between the two cities are hauled by electric locomotives.

RESUMPTION OF TRAFFIC TO MEXICO

Announcement has been made by officers of the Texas & Pacific and International & Great Northern that affairs in Mexico have reached a state where traffic with the United States is being resumed. The International & Great Northern, in connection with the Texas & Pacific and St. Louis, Iron Mountain & Southern, previous to the trouble in Mexico ran through trains via Laredo, Tex., to the City of Mexico in connection with the National Railways of Mexico. The war caused the suspension of this traffic. Recently arrangements have been made with the Constitutionalists for an interchange of traffic between the Gould lines and the Mexican railways at Laredo. All freight in both directions is transferred in the International & Great Northern yards at Laredo. No through rates are in effect and through bills of lading cannot be issued. Through train service over the railroad between Laredo and the City of Mexico was resumed on August 26, the track which was destroyed in connection with the operations of the war having been made passable. Numerous branch roads are being repaired rapidly.

THE SAN FRANCISCO FAIR

An army of men is now busily engaged in completing the landscaping of the Panama-Pacific International Exposition. The era of construction on the exhibit palaces has passed and the installation of exhibits has begun. Within a few weeks thousands of exhibitors, with their army of attendants, will be installing their displays. Altogether more than 70,000 tons of exhibits will be brought to the grounds, the freight charges on which, it is estimated, will entail an outlay of more than $4,000,000. The traffic department of the exposition estimates that more than 1,000,000 people will cross the Rocky mountains to the Pacific coast next year.

FOREIGN ELECTRIFICATION PROJECTS

Among the many large and important engineering improvements which will undoubtedly be seriously delayed because of the war are the electrifications of steam railroads in Germany, France and other countries. The greatest delay may be expected in Germany, partly because of the diversion of government funds to war purposes and partly because of the fact that the latest electrification, that in Silesia, is close to the Russian border. In any event, the railroads will be so overcrowded because of troop and supply transportation that no such interruptions as are incident to a change from steam to electricity would be permitted. It is doubtful also whether the state railway electrification will be furthered in a time of such financial stress.

NEW YORK STATE BARGE CANAL

The engineers of the western division of the New York Barge Canal are preparing plans for the construction of sections of the canal under six railroad crossings east of Rochester and six west of that city. The work on this part of the canal has been postponed because of litigation as to the right of the state to take the land occupied by the railroads. A recent court decision affirms the right of the state to exercise eminent domain in these cases; but the state must build and maintain the bridges necessary for the crossing of the railroads. State Engineer Bensel reports that the terminal facilities for the canal in Rochester, Syracuse, Oswego and other cities will be ready by the time the canal is finished. About 70 per cent of the work on the canal between Buffalo and Albany has been turned over by the contractors to the state.

BROTHERHOODS ENJOINED

Five conductors of the St. Louis Southwestern went into court at St. Louis recently and secured a temporary injunction restraining five vice-presidents of railwaymen's unions from bringing about a strike following an ultimatum delivered to the management of the road. The trouble arose when the management refused to reinstate a conductor who had been accused of drunkenness. The five conductors said a majority of the engineers employed by the road had voted against a strike and that the engineers' brotherhood had withdrawn from the federation when it appeared that the strike order would be issued. The defendants must show cause why the injunction should not be made permanent. Soon after the injunction was granted the railroad company asked the Federal Board of Mediation to use its offices to avert the strike. President Britton said that this action was taken in order to leave no stone unturned toward preventing the strike.

GOVERNMENT FREIGHT CAR STANDARDS IN CANADA

The Board of Railway Commissioners for Canada, modifying its general order of February 17, 1913, respecting safety appliances on trains, has granted an extension of time until July 1, 1916, within which to make the following changes:

To change the location of brakes on all cars; to comply with the standard specifications prescribed in the regulations in respect of all brakes; to change cars having less than 10 in. end ladder clearance within 30 in. of the side of car; to comply with the standard prescribed in the regulations in respect to hand holds, running boards, ladders, sill steps, and brake staffs, except that when a car is shopped for work amounting practically to rebuilding the body of the car, it must then be equipped according to the prescribed standard regulations.

Railway companies are not to be required to make changes to secure additional end ladder clearance on cars that have 10 or more inches end ladder clearance within 30 inches of side of car, or to make the changes in end ladders, side ladders, hand grips and steps which have been made in accordance with the provisions of the general order above referred to, or to comply with the board's regulations aforesaid, until the car is shopped for work amounting to practically rebuilding body of car.

And it is further ordered that railway companies shall not be required to change the location of hand holds (except end hand holds under the end sills), ladders, sill steps, brake wheels, and brake staffs on freight train cars where the appliances are within 3 in. of the required location, except that when cars undergo regular repairs they must then be made to comply with the prescribed standards.

AIR BRAKE STORY PRIZES

The judges in the Westinghouse Air Brake Company prize story contest have made their decision, awarding the first prize of $1,000 to James Cain, engineer of the Wabash Railroad at Peru, Ind. The second prize of $500 was awarded to H. C. Woodbridge, general manager's special representative, Buffalo, Rochester & Pittsburgh, Rochester, N. Y.; the third prize of $200 to Alexander M. Stewart, engineer, Illinois Central, McComb, Miss.; the fourth prize of $150 to D. Oxenford, road foreman of engines, Lehigh Valley, New York City; the fifth prize of $100 to Carl H. Fuller, chief engineer, Macon Railway & Light Company, Macon, Ga., and the sixth prize of $50 to Millard F. Cox, assistant superintendent machinery, Louisville & Nashville, Louisville, Ky. Considerably over 300 contributions were entered in this contest, the judges being W. E. Symons, consulting mechanical engineer, Chicago; Willard Smith, editor of the Railway Review, Chicago, and Roy V. Wright, managing editor of the Railway Age Gazette, New York City.

RAILROAD CLUB MEETINGS

Club	Next Meeting	Title of Paper	Author	Secretary	Address
Canadian	Oct. 13	Wooden Frame Cars in Freight Trains	G. Smart	James Powell	Room 13, Windsor Hotel, Montreal.
Central	Nov. 13	Steel Equipment	H. M. Butts	H. D. Vought	95 Liberty St., New York City.
New England	Oct. 13	Cape Cod Canal	Capt. J. W. Miller	Wm. Cade, Jr.	683 Atlantic Ave., Boston, Mass.
New York	Oct. 16			H. D. Vought	95 Liberty St., New York City.
Pittsburgh	Oct. 23	Annual Meeting		J. B. Anderson	207 Penn. Station, Pittsburgh, Pa.
Richmond	Oct. 12			F. O. Robinson	C. & O. Ry., Richmond, Va.
St. Louis	Oct. 9			B. W. Frauenthal	Union Station, St. Louis, Mo.
Southern & S'w'rn	Nov. 19			A. J. Merrill	218 Grant Bldg., Atlanta, Ga.
Western	Oct. 20			Jos. W. Taylor	1112 Karpen Bldg., Chicago, Ill.

CERTAIN OXY-ACETYLENE APPARATUS CONDEMNED

At a recent meeting in Chicago of the International Acetylene Association resolutions were adopted condemning apparatus for oxy-acetylene work which provides for the generation and self-compression of acetylene or oxygen at a pressure greater than 15 lb. per sq. in. The resolutions were presented by a committee of which Professor Pond, University of Pennsylvania, was chairman, following the report of the committee on oxy-acetylene of which Augustine Davis, president Davis-Bournonville Company, was chairman. The resolutions referring to the generation and compression of acetylene gas are in accord with the regulations of the National Board of Fire Underwriters. Owing to the numerous accidents resulting from the simultaneous generation and self-compression of oxygen by heating chlorates, the association condemns this practice and recommends that chlorates should not be used for the generation of oxygen, except in connection with an efficient washing system and gas holder operating under inconsiderable pressure, and that compression be effected only by means of compressors especially constructed for oxygen.

MEETINGS AND CONVENTIONS

Railway Storekeepers' Association.—The twelfth annual convention of the Railway Storekeepers' Association will be held at the Hotel Sherman, Chicago, May 17-19, 1915.

Industrial Welfare and Efficiency Conference.—The commissioner of Labor and Industry of the state of Pennsylvania, Honorable John Price Jackson, has called the second Pennsylvania Industrial Welfare and Efficiency Conference to meet in Harrisburg, November 16-20, inclusive. The commissioner is determined that each of these conventions will mark a definite step in advance and each year will see his efforts more representative and more widely extended. It is the desire of the commissioner that the exhibit this year be kept along the lines that bear particularly on the interests represented by his department, and the Engineers' Society of Pennsylvania has undertaken to manage this part of the convention. Manufacturers and distributors of products to improve the safety, sanitation, welfare and efficiency of the factory, office and home are asked to exhibit.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting of mechanical associations.

AIR BRAKE ASSOCIATION.—F. M. Nellis, 53 State St., Boston, Mass. Convention, May 5-7, 1915, Hotel Sherman, Chicago.

AMERICAN RAILWAY MASTER MECHANICS' ASSOC.—J. W. Taylor, Karpen building, Chicago.

AMERICAN RAILWAY TOOL FOREMEN'S ASSOCIATION.—Owen D. Kinsey, Illinois Central, Chicago. Convention, July, 1915, Chicago.

AMERICAN SOCIETY FOR TESTING MATERIALS.—Prof. E. Marburg, University of Pennsylvania, Philadelphia, Pa.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. Thirty-ninth St., New York. Convention, December 1-4, 1914, New York.

CAR FOREMEN'S ASSOCIATION OF CHICAGO.—Aaron Kline, 841 North Fiftieth Court, Chicago; 2d Monday in month, except July and August, Lytton building, Chicago.

CHIEF INTERCHANGE CAR INSPECTORS' AND CAR FOREMEN'S ASSOCIATION.—S. Skidmore, 946 Richmond street, Cincinnati, Ohio.

INTERNATIONAL RAILWAY FUEL ASSOCIATION.—C. G. Hall, 922 McCormick building, Chicago. Convention, May 17-20, 1915, Chicago.

INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.—William Hall, 914 W. Broadway, Winona, Minn. Convention, July, 1915.

INTERNATIONAL RAILROAD MASTER BLACKSMITHS' ASSOCIATION.—A. L. Woodworth, Lima, Ohio.

MASTER BOILER MAKERS' ASSOCIATION.—Harry D. Vought, 95 Liberty St., New York.

MASTER CAR BUILDERS' ASSOCIATION.—J. W. Taylor, Karpen building, Chicago.

MASTER CAR AND LOCOMOTIVE PAINTERS' ASSOC. OF U. S. AND CANADA.—A. P. Dane, B. & M., Reading, Mass.

NIAGARA FRONTIER CAR MEN'S ASSOCIATION.—E. Frankenberger, 623 Brisbane building, Buffalo, N. Y. Meetings monthly.

RAILWAY STOREKEEPERS' ASSOCIATION.—J. P. Murphy, Box C, Collinwood, Ohio. Convention, May 17-19, 1915, Hotel Sherman, Chicago.

TRAVELING ENGINEERS' ASSOCIATION.—W. O. Thompson, N. Y. C. & H. R., East Buffalo, N. Y.

PERSONALS

It is our desire to make these columns cover as completely as possible all the changes that take place in the mechanical departments of the railways of this country, and we shall greatly appreciate any assistance that our readers may give us in helping to bring this about.

GENERAL

E. S. FITZSIMMONS, mechanical superintendent of the Ohio division of the Erie at Cleveland, Ohio, has been appointed mechanical superintendent of the Erie division with headquarters at New York.

CHARLES JAMES, master mechanic of the Erie at Jersey City, N. J., has been appointed mechanical superintendent of the Ohio division at Cleveland, Ohio, succeeding E. S. Fitzsimmons.

W. J. MILLER, master mechanic of the St. Louis Southwestern of Texas at Tyler, Tex., has been appointed superintendent of motive power of the St. Louis Southwestern, with office at Pine Bluff, Ark., succeeding T. E. Adams, deceased.

A. G. TRUMBULL, mechanical superintendent of the Erie at New York, has been appointed assistant to the general mechanical superintendent with headquarters at New York.

DAVID VAN ALSTYNE has been appointed assistant to the vice-president of operation of the New York, New Haven & Hartford, with headquarters at New York. Mr. Van Alstyne will have charge of the test and store departments and the handling of scrap; he will also have supervisory authority over the mechanical department in regard to organization, shop practice, approval of design, standards and requisitions.

MASTER MECHANICS AND ROAD FOREMEN OF ENGINES

R. A. BILLINGHAM has been appointed master mechanic of the Tennessee Central, with office at Nashville, Tenn., succeeding J. J. Clark, resigned.

J. M. KILFOYLE has been appointed master mechanic of the St. Louis Southwestern of Texas at Tyler, Tex., succeeding W. J. Miller, promoted.

CHARLES MANLEY has been appointed master mechanic of the Missouri & North Arkansas, with office at Harrison, Ark., succeeding J. P. Dolan, resigned.

F. H. MURRAY, master mechanic of the Erie at Port Jervis, N. Y., has been transferred to Jersey City, N. J., succeeding Charles James.

GEORGE SEARLE, formerly general roundhouse foreman of the Atchison, Topeka & Santa Fe at San Bernardino, Cal., has been appointed master mechanic of the Los Angeles division of the San Pedro, Los Angeles & Salt Lake at Las Vegas, Nev., succeeding W. A. Rogers, resigned.

W. H. SNYDER, general foreman of the Erie at Stroudsburg, Pa., has been appointed master mechanic at that point, succeeding T. S. Davey, promoted.

GEORGE THIBAUT, general foreman of the Erie at Susquehanna, Pa., has been appointed master mechanic at Port Jervis, N. Y., succeeding F. H. Murray.

WILLIAM V. WICKS has been appointed road foreman of engines of the Northern Pacific, at Jamestown, N. D.

CAR DEPARTMENT

T. S. DAVEY, master mechanic of the Erie at Stroudsburg, Pa., has been appointed shop superintendent of the car shops at Buffalo, N. Y. Mr. Davey started railroad work with the

Delaware, Lackawanna & Western at Scranton, Pa., in 1893 where he served his apprenticeship as machinist. In 1898 he entered the service of the Erie at Stroudsburg, Pa., as a machinist. He was later appointed gang foreman and general foreman, holding the latter position for eight years. About three years ago he was appointed master mechanic at Stroudsburg, the position he now leaves to become shop superintendent at Buffalo, as above noted.

JOHN A. BIEBER, coach yard foreman of the Atchison, Topeka & Santa Fe at Richmond, Cal., has been appointed repair track foreman at that point.

A. J. CHUBB has resigned the position of chief inspector, car department of the Pere Marquette, and that position has been abolished.

B. FLAHERTY has been appointed general car foreman of the Chicago, Rock Island & Pacific at Manly, Ia., succeeding J. E. Giesler.

FRANK L. FOX has been appointed general foreman, car department, of the Pere Marquette, with headquarters at Detroit, Mich. He will have jurisdiction over all matters pertaining to the car department.

W. H. HADLEY, repair track foreman of the Atchison, Topeka & Santa Fe at Richmond, Cal., has been appointed car foreman at Winslow, Ariz.

W. D. LEFEBERIES has been appointed car foreman of the Chicago, Rock Island & Pacific at Peoria, Ill., succeeding S. E. Nell.

S. E. NELL has been appointed car foreman of the Chicago, Rock Island & Pacific at Rock Island, Ill., succeeding B. Flaherty.

PETER OLSON has been appointed temporary car foreman of the Chicago, Rock Island & Pacific at Inver Grove, Minn.

WILLIAM SCHMALZRIED, foreman of car shops of the Texas & Pacific at Ft. Worth, Tex., has been appointed master car builder, with office at Marshall, Tex., succeeding W. D. Minton, resigned.

C. A. ZWEIBEL has been appointed surpervisor of car repairs of the Atlantic Coast Line, with office at Wilmington, N. C., succeeding E. A. Sweeley, resigned, to go to another company.

SHOP AND ENGINE HOUSE

A. ANDERSON has been appointed boiler foreman of the Chicago, Rock Island & Pacific at Manly, Iowa, succeeding C. Lynch.

E. E. CHRYSLER, master mechanic of the Chicago & Alton at Slater, Mo., has been appointed superintendent of shops of the Oregon Short Line, with headquarters at Pocatello, Idaho, succeeding D. J. Malone, deceased.

P. F. HARRIS has been appointed day roundhouse foreman of the Chicago, Rock Island & Pacific at Manly, Iowa, succeeding G. T. Schroeder.

L. L. HOFFMAN has been appointed night roundhouse foreman of the Chicago, Rock Island & Pacific at Manly, Iowa, succeeding P. F. Harris.

H. KRABBENHOFT has been appointed night foreman of the Chicago, Rock Island & Pacific at Rock Island, Ill., succeeding F. Meredith.

WILLIAM SCHUMAN has been appointed general foreman of shops of the Chicago, Indianapolis & Louisville at Lafayette, Ind., succeeding George Crumbo, resigned.

PURCHASING AND STOREKEEPING

E. O. GRIFFIN, general fuel and supply agent of the International & Great Northern, has been appointed purchasing agent for the receivers, with headquarters at Houston, Tex., and will report to Thornwell Fay, assistant to receivers.

H. E. HALLENBECK has been appointed storekeeper of the Albuquerque division of the Atchison, Topeka & Santa Fe at Belen, N. M., succeeding N. R. Snowden.

J. V. MAYHALL has been appointed assistant storekeeper of the Baltimore & Ohio at Parkersburg, W. Va., succeeding W. D. Stone.

H. E. RAY has been appointed general storekeeper of the Atchison, Topeka & Santa Fe at Topeka, Kan.

J. H. SANFORD, purchasing agent of the New York, New Haven & Hartford at New Haven, Conn., has been appointed purchasing agent of the Connecticut Company, and will also buy for the Rhode Island Company, the Housatonic Power Company, the Berkshire Street Railway, the New York & Stamford Railway, the Westchester Street Railroad and the Westport Water Company. Mr. Sanford will have his headquarters at New Haven.

G. A. SECOR, storekeeper of the Minneapolis & St. Louis at Minneapolis, Minn., has been appointed general storekeeper of the Chicago & Alton at Bloomington, Ill., succeeding Daniel Downing, resigned.

N. R. SNOWDEN has been appointed storekeeper of the New Mexico division of the Atchison, Topeka & Santa Fe north of Las Vegas, with headquarters at Raton, N. M., succeeding A. B. Wachter.

K. R. STEWART has been appointed storekeeper of the Atchison, Topeka & Santa Fe at San Bernardino, Cal., succeeding H. E. Ray.

A. B. WACHTER has been appointed storekeeper of the Albuquerque division of the Atchison, Topeka & Santa Fe at Albuquerque, N. M., succeeding K. R. Stewart.

C. M. WESTER has been appointed storekeeper of the Baltimore & Ohio, with office at Parkersburg, W. Va., succeeding D. L. Donaldson.

I. C. C. APPOINTMENTS

FRED M. BAUMGARDNER has been appointed senior inspector of motive power in the central district, division of valuation, Interstate Commerce Commission, with headquarters at Chicago. His experience has been with the mechanical department of the Union Pacific and the Illinois Central, having served as roundhouse foreman, general foreman and master mechanic on the latter road and having recently been made master mechanic at Clinton, Ill.

R. F. PETERS, mechanical engineer of the San Antonio & Aransas Pass at San Antonio, Tex., has been appointed senior mechanical engineer of the Western district, division of valuation, Interstate Commerce Commission, with headquarters at Kansas City, Mo.

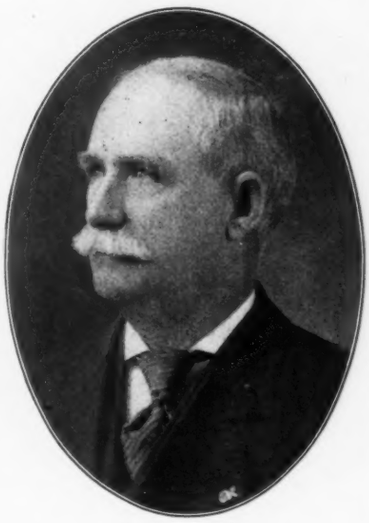
M. E. WELLS, who is now engaged on the appraisal of the Pere Marquette for the Michigan Railroad Commission, has been appointed senior inspector of motive power, division of valuation, Interstate Commerce Commission, for the Southern district, with headquarters at Chattanooga, Tenn., effective on October 1.

OBITUARY

THOMAS E. ADAMS, superintendent of motive power of the St. Louis Southwestern, with headquarters at Pine Bluff, Ark., died at his home in that city on August 25 at the age of 63 years. Mr. Adams has been in railway service since August, 1865, when he began as a fireman on the Illinois Central. He was consecutively locomotive engineer on that road, the Illinois Midland, the St. Paul, Minneapolis & Manitoba and the Great Northern, from November, 1870, to February, 1893, when he was appointed division master mechanic on the Great Northern. Three years later he became superintendent of the Dakota di-

vision of that road, and from February, 1897, to April, 1901, he was master mechanic of the Fergus Falls division and master mechanic at Superior, Wis. He then went to the St. Louis Southwestern as general master mechanic, and in July, 1905, was promoted to superintendent of motive power.

FRANK W. CHAFFEE, general car inspector of the New York Central & Hudson River, with headquarters at Albany, N. Y., died on September 15. He was born on December 17, 1850, at Springfield, Mass., and began railway work in 1868 as car repairer on the Connecticut River Railroad, now a part of the Boston & Maine. From September, 1870, to December, 1872, he was with the Wason Car Manufacturing Company, and then to June, 1881, was in the car building department of the Boston & Albany. He was then for three years in the service of the Baltimore & Ohio at Camden station, Baltimore, and on June 1, 1884, left that company to go to the New York Central & Hudson River as general foreman of the West Albany, N. Y., shops. He remained in that position until March, 1895, when he was promoted to master car builder at the same shops, and since February 1, 1901, has been general car inspector of the same road.



F. W. Chaffee

DANIEL E. SULLIVAN, formerly master mechanic of the Union Pacific at Cheyenne, Wyo., died at Ogden, Utah, on August 20, aged 60 years. He was employed by the Union Pacific for 34 years, retiring July 1 last on account of illness.

NEW SHOPS

SOUTHERN RAILWAY.—A contract has been given to P. J. White & Son, Richmond, Va., for the construction of shop buildings at Richmond, and a contract has been given to the J. T. Wilson Company, Richmond, for building a transformer house at South Richmond.

SOUTHERN RAILWAY.—A contract has been given to the Ragland-Baxter Morford Company, Nashville, Tenn., for the construction of shop buildings at Memphis, and a contract has been given to the R. F. Creson Company, Memphis, for putting up a pump house, also transformer house at Memphis.

ILLINOIS CENTRAL.—A contract has been awarded for the construction of a mechanical terminal at Jackson, Miss., to Geo. B. Swift & Company, Chicago. The improvement consists of structures as follows: A roundhouse having five 100-ft. stalls with walls of concrete and brick construction, and roof of wood, covered with composition roofing; an 85-ft. turntable electrically operated; a machine shop and boiler room 40 ft. by 75 ft. by 16 ft., high, with brick walls and a flat concrete roof covered with composition roofing; an oil house and storeroom 30 ft. by 60 ft. one story high, with a low wooden platform 40 ft. by 75 ft. at one end; a shelter and shop building 20 ft. by 140 ft. by 11 ft. high, of wooden construction, and sand bins, 9 ft. by 98 ft. by 9 ft. high, also of wooden construction; a 500-ton wooden coal chute which is being built by the Ogle Construction Company, Chicago.

SUPPLY TRADE NOTES

Charles B. Yardley, Jr., formerly of Jenkins Bros., has been appointed manager of the railway department of the United States Metal Products Company, New York.

The C & C Electric & Manufacturing Company, Garwood, N. J., has removed its Detroit office, in charge of R. K. Slaymaker, from 144 Seyburn avenue to 1111 Chamber of Commerce building.

A. T. Gardiner, for many years connected with the Landis Tool Company, Waynesboro, Pa., has accepted a position with the Modern Tool Company, Erie, Pa. He will cover the same territory as when with the Landis Tool Company.

J. G. Coutant, formerly engineer of the plant of the Lima Locomotive Corporation, Lima, Ohio, has gone with the Railway Materials Company, Chicago, Ill., to specialize in the design of furnaces for burning powdered fuel and water gas, having done considerable experimenting in this work.

The Raymond Concrete Pile Company, New York, has been awarded a contract for the design and construction of concrete ore, coke and limestone bins, and ore and yard trestles, by the Pennsylvania Steel Company, Steelton, Pa. The work calls for several thousand concrete piles and a large yardage of concrete construction.

The Transportation Utilities Company, with general offices at 30 Church street, New York City, has opened a branch office at 1201 Virginia Railway & Power building, Richmond, Va. This office is in charge of Frank N. Grigg, and is devoted exclusively to the appliances manufactured by the Transportation Utilities Company.

The U. S. Metal & Manufacturing Company, New York, has been appointed resident purchasing agent in America for the following companies: Underground Electric Railways of London, Ltd., the London General Omnibus Company, Ltd., the Metropolitan District Railway, the London Electric Railway, the Central London Railway and the City & South London Railway.

The Gun-crete Company, Chicago, has acquired the interests of the Cement Gun Construction Company and has absorbed the construction department of the General Cement Gun Company. The combined business will be conducted under the name of the Cement Gun Construction Company, with office at Chicago. Carl Weber is president, John V. Schaefer, secretary and treasurer, and C. L. Dewey, construction manager.

W. J. Johnson, formerly of the Western Electric Company, has recently been appointed a member of the engineering department of the Stentor Electric Manufacturing Company, Inc., New York. Mr. Johnson, who has had an extended experience with the Bell Telephone Company of Pennsylvania, and the Chesapeake & Potomac Telephone Company of Baltimore, will look after the installation work which the company has on hand.

H. O. Fettinger has been appointed eastern railroad representative of the Ashton Valve Company, Boston, Mass., with headquarters at 128 Liberty street, New York, to succeed W. H. Foster, resigned to become associated with another company. Mr. Fettinger formerly served for a number of years in the motive power department of the Pennsylvania Railroad, and resigned from the position of chief air brake and steam heat inspector to engage in the supply business.

At a meeting of the board of directors of the American Locomotive Company, held September 16, S. L. Schoonmaker was elected chairman of the board, succeeding Pliny Fisk, resigned, and Andrew W. Mellon, president of the Mellon National Bank of Pittsburgh, was elected a director succeeding James McNaughton. Mr. McNaughton will continue as vice-president. Mr. Schoonmaker is a director of the General Electric Company and the American Telephone & Telegraph Company.

T. P. Gaylord, who has recently been elected acting vice-president of the Westinghouse Electric & Manufacturing Company, succeeding Henry D. Shute, was born at Shelby, Mich., and attended preparatory school at Allen Academy, Chicago. He subsequently attended the Univeristy of Michigan, and in 1895 received the degree of electrical engineer from the Armour Institute of Technology. Mr. Gaylord was engineer of underground construction during the World's Fair at Chicago, 1892-3. At the close of the fair he became assistant professor of electrical engineering in the Armour Institute, and retained that position until 1898, when he became associated with the Commonwealth Edison Company of Chicago as electrical engineer. In July, 1899, he entered the employ of the Westinghouse Electric & Manufacturing Company as a salesman, and followed this line of work until 1903, when he was appointed district manager at Chicago, which position he has held up to the present. Mr. Gaylord is a member of the American Institute of Electrical Engineers, the National Electric Light Association, and a number of other engineering societies.

T. P. Gaylord

Henry D. Shute has been elected treasurer of the Westinghouse Electric & Manufacturing Company. Mr. Shute was born at Somerville, Mass., and attended high school in Boston. He graduated from the Massachusetts Institute of Technology in 1892, and following his graduation spent a year in Germany at the School of Mines, Clausthal, and in Dresden. In 1893 he entered the works of the Westinghouse Electric Company at Pittsburgh as an apprentice, and spent his first two years in the testing department, following which he was engaged for a considerable time in erection and laboratory work, part of the time as assistant foreman. In 1897 he entered the engineering department. One year later he was transferred to the commercial department, and in 1901 was appointed head of the latter's alternating current division. Two years later he was made assistant to vice-president L. A. Osborne, and in that position was particularly active in the development of heavy electric traction and single-phase railway work. In 1910 Mr. Shute succeeded Walter McFarland as acting vice-president, which position he held until his election as treasurer. Mr. Shute is a member of the American Institute of Electrical Engineers, the National Electric Light Association, and the Engineers' Club of New York, and is also a director of the Pittsburgh Chamber of Commerce.

H. D. Shute

CATALOGS

Oil and Gas Burning Appliances.—Bulletin No. 5 of the Quigley Furnace & Foundry Company, Springfield, Mass., is devoted to the line of burners, oil pumps and other furnace appliances developed by this company. It contains eight pages and is well illustrated.

Automatic Train Stop.—The Automatic Railroad Appliance Company, Inc., Rochester, N. Y., has issued an 18-page pamphlet descriptive of the Lawn-Ryan automatic train stop for steam and electric roads. Illustrations of the mechanism are shown, and the description explains the method of operation and installation.

Pneumatic Tools.—Circular V of the Independent Pneumatic Tool Company, Chicago, Ill., is a four-page pamphlet in which the drills and hammers manufactured by this company are illustrated and brief specifications given as to the capacity and service for which they are designed. The specifications are very compactly arranged in tabular form.

Pacific Type Locomotives.—The Baldwin Locomotive Works, Philadelphia, Pa., recently issued record No. 79, which is devoted to Pacific type locomotives. A brief historical sketch of the development of this type of locomotive is followed by a number of illustrated descriptions of Pacific type locomotives recently built by the Baldwin Locomotive Works.

Cleaning Compound.—Information sheet No. 260 of the Oakley Chemical Company, 22 Thames street, New York City, is a 12-page booklet devoted to the application of Oakite to the various car cleaning operations and as a substitute for lye in cleaning air pumps, journal boxes, eccentrics, etc., in the locomotive shop. Directions are given for the use of Oakite in a large number of cleaning operations.

Tube Cleaners.—A number of catalogs have been issued by the Roto Company, Hartford, Conn., containing descriptions of the various types of tube cleaners manufactured by this company. Among these may be noted catalog No. 41, dealing with boiler tube cleaners driven by air or steam; catalog No. 43, in which cutter heads for boiler tube cleaners are described, and catalog No. 44, descriptive of locomotive arch tube cleaners.

Sand Blast.—A reprint of a paper entitled "The Sand Blast from the Users' Viewpoint," which was presented at a recent meeting of the Associated Foundry Foremen, of New York and vicinity, by H. D. Gates, sales manager of the sand blast department, De La Vergne Machine Company, New York, has recently been issued by that company in pamphlet form. It contains considerable information which should be of value to those contemplating the installation of sand blast equipment. Copies will be furnished upon request.

Industrial Furnace Equipment.—The W. S. Rockwell Company, 50 Church street, New York, recently issued a bulletin containing a comparative scale and conversion factors for Fahrenheit and Centigrade thermometers. This information is printed on a stiff card, 9¼ in. by 11¼ in., which is designed to be hung in the laboratory or furnace room, where heat treating operations are conducted. Below the conversion factors are tables showing the various color heats in both Centigrade and Fahrenheit, and suggested tempering heats for use on various tools.

Appliances for Burning Fuel Oil.—A catalog recently issued by Tate, Jones & Co., Inc., Pittsburgh, Pa., deals with the system of oil-burning appliances developed by this company. It is divided into two parts. Considerable space in part one is devoted to the actual result obtained with crude oil in furnace work, tending to show the superiority of fuel oil over coal. The remainder of this part contains well illustrated descriptions of the various types of burners manufactured by this company. Part two contains illustrations and descriptions of pumping systems for handling fuel oil.